mineral resources
& energy

Department:
Mineral Resources and Energy
REPUBLIC OF SOUTH AFRICA

FINAL BASIC ASSESSMENT REPORT (BAR) AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT (EMPR) FOR BEATRIX MINING RIGHT (FS 10047 MR (FS 081 MR)), HELD BY SIBANYE GOLD PROPRIETARY LIMITED (SIBANYE GOLD)

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED)

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FInal Basic Assessment Report and Environmental Management Programme Report for Beatrix Mining Right (FS 10047 MR (FS 081 MR)), held by Sibanye Gold Proprietary Limited

Version – Final

14 January 2026

GCS Project Number: 25-0019

Client Reference: FS 10047 MR (FS 081 MR)

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Final Basic Assessment Report and Environmental Management Programme Report for Beatrix Mining Right (FS 10047 MR (FS 081 MR)), held by Sibanye Gold Proprietary Limited

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14 January 2026

DOCUMENT ISSUE STATUS

Report Issue	Final		
GCS Reference Number	25-0019		
Client Reference	FS 10047 MR (FS 081 MR)		
Title	Final Basic Assessment Report and Environmental Management Programme Report for Beatrix Mining Right (FS 10047 MR (FS 081 MR)), held by Sibanye Gold Proprietary Limited		
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IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation (EA) can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the Environmental Impact Assessment (EIA) Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the Competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the Competent Authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an EA for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the EA being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The Environmental Assessment Practitioner (EAP) must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the Applicant.

Objective of the Basic Assessment Process

The objective of the Basic Assessment process is to, through a consultative process—

(a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;

(b) identify the alternatives considered, including the activity, location, and technology alternatives;

(c) describe the need and desirability of the proposed alternatives;

(d) the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on the these aspects to determine:

(i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and

(ii) the degree to which these impacts:

aa) can be reversed;

bb) may cause irreplaceable loss of resources; and

(cc) can be managed, avoided or mitigated;

(e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—

(i) identify and motivate a preferred site, activity and technology alternative;

(ii) identify suitable measures to manage, avoid or mitigate identified impacts; and

(iii) identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

GCS Environment South Africa (Pty) Ltd (GCS) was appointed as the independent Environmental Assessment Practitioner to undertake the Basic Assessment (BA) process for the proposed administrative amendment to the Beatrix Mining Right (MR) in the Free State Province. This BA has been prepared in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the Environmental Impact Assessment Regulations, 2014. The application concerns the consolidation and restructuring of existing mining rights following Sibanye-Stillwater's transaction with Neo Uranium Resources South Africa (Neo Energy). Importantly, the amendment is administrative in nature and does not entail new physical development, mining expansion, or intensification of activities.

The Beatrix MR (FS 10047 MR (FS 081 MR)) covers Beatrix 4 Shaft (the Beisa Project / Operation), situated south of Virginia and within the Matjhabeng and Masilonyana Local Municipalities. Mining operations are already authorised under the approved Environmental Management Programme (EMPr) and will continue within the existing footprint.

<u>Need and Desirability</u>

The administrative amendment is necessary to align legal ownership of Beatrix 4 Shaft with the approved transaction, ensuring regulatory compliance under the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA). From a need perspective, the amendment enables continued lawful mining, prevents regulatory uncertainty, and supports long term environmental governance. From a desirability perspective, the project sustains employment opportunities, contributes to socio-economic upliftment in the Lejweleputswa District, and ensures ongoing royalties, taxes, and procurement benefits. The transaction further provides clarity for closure planning and facilitates investor confidence, while ensuring no new physical impacts on sensitive environmental resources.

<u>Purpose and Scope of the Basic Assessment Report</u>

The objectives of this process are to:

- Evaluate the biophysical, socio-economic, and cultural environment of the Beatrix 4 Shaft area.
- Identify and assess the positive and negative impacts of the project in its operational and decommissioning phases.
- Define mitigation and management measures to minimise risks and enhance benefits.
- Ensure that post-mining landscapes are safe, stable, and non-polluting, supporting long term ecological and socio-economic resilience.
- Integrate all specialist study findings into a structured Impact Management

Programme that aligns with best practice and South African legislation.

Environmental and Social Baseline

Topography and Soils: The Beatrix 4 Shaft area is characterised by gently undulating plains of the Free State highveld, with elevations between 1 285 and 1 450 metres above mean sea level. Mining activities have resulted in permanent topographical modifications due to tailings storage facilities (TSFs), waste rock dumps (WRDs), and evaporation dams. Sandy upland soils are vulnerable to erosion, while valley-bottom soils are at risk of gulley erosion and salinisation. Soils in operational areas are further exposed to hydrocarbon and chemical contamination.

Groundwater: Hydrogeological studies confirm that seepage from TSFs, WRDs, and evaporation dams has already affected groundwater quality within the immediate environment. Elevated sulphates, chlorides, and uranium concentrations have been detected in downgradient boreholes, with contaminant plumes migrating towards the Boschluis Spruit valley-bottom wetland. Groundwater rebound during decommissioning will increase the risk of decant and wider plume migration.

Surface Water and Wetlands: Surface water resources, particularly the Boschluis Spruit and associated channelled valley-bottom wetland system, are Moderately Modified but remain ecologically significant. Impacts include salinisation, sulphate loading, and contamination from hydrocarbon and chemical spillages. The seep wetlands and depressional pans (including those converted to evaporation dams) have been heavily altered, but they continue to provide ecosystem services such as flood attenuation, nutrient assimilation, and waterbird habitat.

Flora: The project area falls within the Grassland Biome, dominated by Gh10 Vaal-Vet Sandy Grassland, which is classified as Endangered, with over 63% already transformed. Key species of conservation importance include *Boophone disticha* (Bushman's Poison Bulb), *Crinum bulbispermum* (Orange River Lily), *Eucomis autumnalis* (Pineapple Lily), *Hypoxis hemerocallidea* (African Potato), and *Brunsvigia species* (Candelabra Flowers). These slow-growing and culturally significant species are particularly vulnerable to disturbance and unsustainable harvesting. Invasive alien species such as *Tamarix ramosissima* (Salt Cedar) and *Opuntia ficus-indica* (Prickly Pear) threaten native vegetation integrity.

Fauna: The faunal assessment confirmed the presence or potential occurrence of species of conservation importance, including the Black-footed Cat (*Felis nigripes*), *Tyto capensis* (African Grass-owl), *Sagittarius serpentarius* (Secretary bird), and *Pyxicephalus adspersus* (Giant Bullfrog). Grassland and wetland habitats remain critical for raptors, amphibians, and waterbirds. Invertebrates such as butterflies and dragonflies persist as ecological indicators but show reduced diversity due to habitat transformation.

Air Quality and Noise: Air quality risks are mainly associated with fugitive dustfall from TSFs, WRDs, exposed surfaces, and unpaved haul roads. Dust is monitored monthly using ASTM D1739 dustfall stations and compared to the National Dust Control Regulations (2013), with results generally within allowable limits and isolated exceedances remaining within permitted frequency. Noise monitoring in 2025 confirmed compliance with South African National Standard (SANS) 10103:2008, with ambient sound levels at surrounding receptors dominated by natural rural noise rather than mine equipment.

Heritage: Several heritage sites have been identified, including Stone Age archaeological scatters, farmsteads, irrigation infrastructure, and numerous cemeteries and burial grounds. These sites are protected by the National Heritage Resources Act, 1999 (Act 25 of 1999) (NHRA), and hold high cultural, religious, and historical significance. Risks include disturbance during operations, demolition, or rehabilitation.

Socio-Economic Environment: Beatrix 4 Shaft will be a cornerstone of the local economy, providing direct employment, indirect jobs through contractors and suppliers, and socio-economic upliftment through procurement, infrastructure investment, and social programmes. However, reliance on mining creates vulnerability: closure will result in significant job losses, reduced municipal revenue, and potential social instability in Matjhabeng and Masilonyana municipalities.

Summary of the Positive and Negative Impacts and Risks

The assessment of the Beatrix 4 Shaft operations and alternatives confirms that the project will deliver a mix of socio-economic benefits and environmental challenges, each carrying different levels of significance depending on the project phase. The analysis incorporates cumulative effects and recognises that while some impacts are unavoidable, mitigation measures can reduce risks and promote sustainable outcomes.

Positive Impacts and Benefits

The proposed activity and its alternatives will generate a number of long term positive contributions:

- Employment and livelihood support: Beatrix 4 Shaft will sustain direct jobs for skilled, semi-skilled, and unskilled workers, while also supporting indirect employment in contracting, transport, retail, and service sectors. This creates a stable income base for households in Matjhabeng and Masilonyana municipalities, with positive knock-on effects for poverty reduction and local economic resilience.
- Skills transfer and capacity building: Ongoing training, apprenticeships, and skills development programmes will enhance workforce capabilities, increasing employability beyond the life of the mine. This aligns with commitments under the

Social and Labour Plan.

- Local economic development: The mine will contribute to local enterprise growth through procurement from small and medium enterprises, supporting agricultural, retail, and service markets. Fiscal benefits, including royalties, corporate tax, and municipal rates, will strengthen state revenue and service delivery capacity.
- Infrastructure and service improvements: Mining operations provide opportunities for road upgrades, water supply improvements, and energy infrastructure investments, which also benefit surrounding communities.
- Community development initiatives: The mine's corporate social responsibility projects and Social and Labour Plan investments will support education, healthcare, and infrastructure in host communities, improving quality of life and reducing inequality.
- Concurrent rehabilitation opportunities: Progressive land shaping, topsoil replacement, and ecological restoration during operations will reduce final closure liabilities and provide early biodiversity and ecosystem service benefits.
- Post-mining land use potential: Decommissioned areas offer long term opportunities for grazing, agriculture, renewable energy projects, and conservation corridors, supporting regional economic diversification beyond mining.

Negative Impacts and Risks

Despite the socio-economic benefits, the activity and alternatives also present a range of potential negative impacts, particularly to environmental systems and vulnerable communities:

- Topographical and landform alteration: WRDs, TSFs, evaporation dams, and other engineered structures will cause permanent changes to the landscape. These may lead to erosion risks, visual intrusion, and long term alteration of natural drainage patterns.
- Soil and land capability loss: Agricultural land will be permanently sterilised within the project footprint. Risks include soil salinisation, erosion of sandy upland soils, gulley formation in alluvial zones, and contamination from hydrocarbons and chemicals, potentially undermining future land use options.
- Groundwater deterioration: Seepage from TSFs, WRDs, and evaporation dams has already contributed to elevated sulphate and chloride levels in local aquifers. Over the life of mine, contaminant plumes may expand, with post closure rebound increasing risks of polluted decant into sensitive wetlands.

- Surface water contamination: The Boschluis Spruit and associated wetlands face risks from seepage, hydrocarbons, chemicals, and solid waste, leading to deterioration in water quality, aquatic ecosystem stress, and reduced ecological services.
- Wetland and biodiversity degradation: Valley-bottom wetlands and pans are at risk from salinisation, altered hydrology, erosion, and invasive alien plants. Loss of intact climax grasslands and habitat fragmentation further threaten biodiversity and Conservation Important species such as *Boophone disticha* (Bushman's Poison Bulb), *Hypoxis hemerocallidea* (African Potato), and the Giant Bullfrog *(Pyxicephalus adspersus*).
- Faunal displacement: Sensitive species, including the *Tyto capensis* (African Grass-owl), *Sagittarius serpentarius* (Secretary bird), and *Felis nigripes* (Black-footed Cat), may be displaced by habitat loss, noise, dust, and artificial lighting.
- Air quality risks at Beatrix are primarily associated with fugitive dustfall from TSFs, WRDs, exposed surfaces, and haul roads. Ambient dust is monitored monthly using ASTM D1739 dustfall stations and generally remains within the non-residential limit, with occasional exceedances still within permitted frequency. Crystalline silica may occur in the respirable fraction and is managed as an occupational health risk, rather than an ambient community exposure concern.
- Noise intrusion: While generally compliant with standards, operational noise from ventilation fans, conveyor belts, and heavy machinery may cause nuisance to nearby receptors and ecological stress to fauna.
- Heritage risks: Cemeteries, archaeological sites, and historic structures within or adjacent to the MR area may be disturbed, degraded, or lost through operational or closure activities if not properly managed.
- Socio-economic vulnerability: The reliance of local communities on mining revenue creates risks of economic collapse during closure, leading to retrenchments, out-migration, and social instability. Short-term job losses during decommissioning are a significant risk without proactive social transition and reskilling programmes.

Mitigation and Management Framework

The EMPr provides a structured framework to ensure that environmental and socio-economic risks are effectively mitigated, monitored, and managed throughout the life of mine (LoM) and post closure. Although the current amendment is administrative in nature and does not involve new surface disturbances, the EMPr remains central to safeguarding environmental integrity and ensuring compliance with the legal requirements.

Soils and land capability are protected through stripping and stockpiling of topsoil prior to disturbance, implementing erosion control measures such as berms and vegetative cover, and ensuring bunded storage for hydrocarbons and hazardous substances. During closure, disturbed land will be re-contoured, contaminated soils remediated, and indigenous vegetation re-established to retain land capability for grazing and limited agriculture.

Water resources are safeguarded through strict separation of clean and dirty water systems in line with Government Notice 704, supported by stormwater management plans with diversion channels, containment facilities, and compliance monitoring. Continuous groundwater and surface water monitoring is undertaken across an extensive network of boreholes, dams, and spruits, with results submitted quarterly to the Department of Water and Sanitation (DWS). A Trigger Action Response Plan has been implemented with threshold values for sulphate, chloride, uranium, and electrical conductivity to provide early warning of deteriorating conditions. Seepage interception systems, toe drains, and lined containment facilities will remain operational for LoM and post closure, supported by long term monitoring to prevent uncontrolled decant or off-site plume migration.

Wetlands and biodiversity are managed through the establishment of no-go buffer zones around sensitive wetlands, alien invasive species control (e.g., *Tamarix* spp. and *Opuntia* spp.), and progressive rehabilitation of degraded pans, seep wetlands, and riparian areas using indigenous vegetation. The EMPr commits to conserving Conservation Important species such as *Boophone disticha* (Bushman's Poison Bulb), *Hypoxis hemerocallidea* (African Potato), and the Pyxicephalus adspersus (Giant Bullfrog), with ongoing monitoring of wetland Present Ecological State and Ecological Importance and Sensitivity ratings.

Air quality and noise are monitored through a programme of monthly dustfall monitoring using ASTM D1739-compliant buckets, assessed against the National Dust Control Regulations (2013) for non-residential areas. Dust suppression measures, including water application on haul roads and progressive rehabilitation of exposed surfaces, are implemented to reduce fugitive emissions from TSFs, WRDs, and disturbed ground. Noise is monitored in accordance with SANS 10103:2008, with recent measurements confirming compliance and showing that ambient sound levels are dominated by natural rural sources, rather than mining equipment.

Heritage resources are protected through chance find procedures, demarcated buffer zones, and the implementation of a Heritage Management Plan. Where unavoidable, disturbance of graves, burial grounds, or archaeological and palaeontological sites will only proceed following authorisation from the South African Heritage Resources Agency and consultation with affected communities.

Socio-economic management is guided by the Social and Labour Plan, which prioritises local employment, training, and procurement. Proactive planning for mine closure includes a transition plan at least five years before decommissioning to manage retrenchments, support reskilling, and sustain municipal revenues. Partnerships with municipalities and local businesses will promote diversification into alternative sectors such as renewable energy and agriculture.

Waste and pollution control are managed through a site-wide Waste Management Plan that includes segregation, recycling, licensed disposal, and auditing in line with National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008). Hazardous substances must be stored in lined, bunded areas with capacity for 110% of the largest container. Post closure, all contaminated soils will be excavated, treated (e.g., bioremediation), or disposed of at licensed facilities.

Closure and rehabilitation planning is a continuous process, with a detailed Closure Plan updated every five years to ensure sufficient financial provision. Key measures include capping TSFs and WRDs with at least 500 mm of soil cover, stabilisation through indigenous vegetation, and long term water treatment and monitoring. Post closure monitoring for groundwater, surface water, biodiversity, and air quality must continue for a minimum of five years, or longer if residual risks persist. Rehabilitation success will be tracked through vegetation establishment, erosion control, and land capability assessments.

Monitoring and reporting obligations are central to the framework. All environmental monitoring programmes (including surface water, groundwater, biomonitoring, air quality, noise, biodiversity, and socio-economic indicators) will continue through LoM and post closure where necessary. Results feed into annual performance assessments and environmental audits, which must be submitted to the Department of Mineral and Petroleum Resources and DWS to confirm compliance with the EMPr and authorisation conditions.

Conclusion and Way Forward

The BAR and EMPr for Beatrix 4 Shaft has comprehensively evaluated the potential environmental and socio-economic impacts. The assessment demonstrates that while the project is associated with unavoidable negative impacts, such as the continued transformation of land, risks to soil, water, flora, fauna, air quality, noise, and cultural heritage, these impacts can be effectively managed and reduced to acceptable levels through the robust mitigation framework outlined in the EMPr.

At the same time, the project offers significant positive contributions. These include sustaining direct and indirect employment, providing procurement opportunities to local suppliers, generating revenue for municipalities, and creating opportunities for skills development and socio-economic upliftment. Furthermore, the continued use of the existing authorised footprint minimises the need for new disturbance, ensuring that the project avoids unnecessary environmental degradation.

The EMPr provides a strong management framework aligned with the NEMA, the MPRDA, and other applicable legislation. It emphasises proactive rehabilitation, heritage protection, groundwater and surface water management, biodiversity conservation, and ongoing stakeholder engagement. Monitoring, reporting, and adaptive management commitments have been clearly set out to ensure accountability and compliance throughout the LoM, closure, and post closure phases.

Overall, with strict adherence to the mitigation measures, conditions of authorisation, and long term monitoring requirements, the proposed activity at Beatrix 4 Shaft is considered both environmentally manageable and socio-economically desirable. The project's continuation, within the existing authorised footprint, will balance economic opportunity with environmental protection, leaving a legacy of responsible resource use, progressive rehabilitation, and strengthened community resilience.

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LIST OF ABBREVIATIONS

Abbreviation	Description
AIDS	Acquired Immune Deficiency Syndrome
AEL	Atmospheric Emissions Licence
BA	Basic Assessment
BAR	Basic Assessment Report
CA	Competent Authority
CI	Conservation Important
COP	Code of Practice
DFFE	Department of Forestry Fisheries
DMPR	Department of Mineral and Petroleum Resources
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
E&S	Environmental and Social
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
E&S	Environmental and Social
EC	Electrical Conductivity
ECA	Environment Conservation Act
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
ESG	Environmental Social and Governance
GCS	GCS Environment SA (Pty) Ltd
GDP	Gross Domestic Product
GHS	Globally Harmonised System
GN R	Government Notice Regulation
HAS	Hazardous Substances Act, 1973 (Act No. 15 of 1973)
HDPE	High Density Polyethylene
HIA	Heritage Impact Assessment
HIV	Human Immunodeficiency Viruses
4IR	4^{th} Industrial Revolution
I&APs	Interested and Affected Parties
IEM	Integrated Environmental Management
IWWMP	Integrated Water and Waste Management Plan
LoM	Life of Mine
MAE	Mean Annual Evaporation
mamsl	Metres above mean sea level
MAP	Mean Annual Precipitation
MHSA	Mine Health and Safety Act, 1996 (Act No. 29 of 1996)
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MR	Mining Right
NAAQS	National Ambient Air Quality Standards
NBSAP	National Biodiversity Strategy and Action Plan
NDP	National Development Plan
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)
NEMWA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NEMAQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
Neo Energy	Neo Uranium Resources South Africa
NGO	Non-Governmental Organisations
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NT	Near Threatened
NWMS	National Waste Management Strategy
PES	Present Ecological State
PGDS	Provincial Growth and Development Strategy
PM	Particulate Matter
RoM	Run-of-Mine
SACNASP	South African Council for Natural Scientific Professions

Abbreviation	Description
SAHRA	South African Heritage Resources Agency
SANS	South African National Standards
Sibanye Gold	Sibanye Gold Proprietary Limited
SLP	Social and Labour Plan
SMEs	Small And Medium Enterprises
SOFS	Southern Free State
SPR	Source Pathway Receptor
TARP	Trigger Action Response Plan
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
VOCs	Volatile Organic Compounds
Wits Gold	Witwatersrand Consolidated Gold Resources
WMA	Water Management Area
WML	Waste Management Licence
WWTW	Wastewater Tent Works
WRDs	Waste Rock Dumps
WUL	Water Use Licence
WULA	Water Use Licence Applications

UNITS OF MEASUREMENT

Unit of Measure	Description
°C	Degrees Celsius
%	Percent
ha	Hectares
kL	Kilolitres
kV	Kilovolt
ktpm	Kilo-tonnes per month
mS/m	MilliSiemens per meter
m	Metres
m/s	Metres per second
m^3	Cubic Metres
mm	Millimetres
mg/L	Milligrams per litre
Ml/d	Megalitres per day
MW	Megawatt
MV	Megavolt
V	Volts

CHEMICAL ELEMENTS

Chemical	Description
Au	Gold
NO_x	Oxides of Nitrogen
SO_2	Sulphur Dioxide
U	Uranium

PART A

SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

1 INTRODUCTION

GCS Environment South Africa (Pty) Ltd (GCS) has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Basic Assessment (BA) process for the proposed administrative amendment to the Beatrix Mining Right (MR) in the Free State Province of South Africa. This process is being carried out in terms of the Environmental Impact Assessment (EIA) Regulations, 2014, promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), and is guided by the procedural requirements contained in Government Notice Regulation (GN R) 982.

The existing Beatrix MR (FS 10047 MR (FS 081 MR)) (Figure 3-1) is located in the Free State Province, within the Lejweleputswa District Municipality, and falls under the jurisdiction of both the Matjhabeng and Masilonyana Local Municipalities. The MR area lies approximately 25 kilometres (km) south of Virginia, about 40–45 km southeast of Welkom, 25–30 km east of Hennenman, 35–40 km northeast of Theunissen, 45–50 km north of Winburg, around 70 km northeast of Brandfort, 50 km southeast of Odendaalsrus, and roughly 60 km southwest of Ventersburg.

The Beatrix MR is currently held by Sibanye Gold Proprietary Limited (Sibanye Gold). The listed activity that necessitates this BA is Activity 21(d) of Listing Notice 1 (GN R 983), which applies to any activity, including the continued operation of that activity, that requires an amendment or variation to a right or permit in terms of section 102 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

Neo Uranium Resources South Africa (Neo Energy), a subsidiary of Neo Energy Metals, has received approval from the South African Reserve Bank to proceed with the acquisition of Sibanye-Stillwater's Beatrix 4 Shaft (Beisa Project / Operation as illustrated in Figure 3-2). To implement this transaction, Sibanye-Stillwater is required to undertake a series of administrative actions. These include the transfer of ownership of the Southern Free State (SOFS) MR (FS 10005 MR), currently held by Witwatersrand Consolidated Gold Resources (Wits Gold), to Sibanye Gold; the consolidation of a portion of the Sibanye Gold Beatrix MR (Beatrix area as illustrated in Figure 3-1) (FS 10047 MR (FS 081 MR)) into the SOFS MR (FS 10005 MR); and the transfer of the remainder of the Beatrix MR (Beisa Project / Operation as show in Figure 3-2) (FS 10047 MR (FS 081 MR)) from Sibanye Gold to Neo Energy. Upon completion of these actions, the retained portion of the Beatrix MR, which is the subject of this application, will consist of Beatrix 4 Shaft and its supporting infrastructure (Beisa Project / Operation as show in Figure 3-2).

It is critical to highlight that this application is administrative in nature and does not include any changes to physical mining operations, expansions, modifications, or intensifications of activities. All operations associated with Beatrix 4 Shaft will continue as previously authorised in terms of the approved Environmental Management Programme (EMPr) and associated regulatory approvals. The administrative amendment therefore relates only to the restructuring of mining rights to align ownership and legal standing with the approved transaction between Sibanye-Stillwater and Neo Energy.

The objective of this BA process is to ensure that the proposed administrative amendment is undertaken in full compliance with the applicable provisions of NEMA, the EIA Regulations, and other relevant legislation. Furthermore, the process facilitates transparent consultation and engagement with the Competent Authority and all interested and affected parties (I&APs). This approach ensures that stakeholders are provided with an opportunity to review and comment on the proposed amendment, and that decision-making is informed, balanced, and accountable. Importantly, the BA process provides assurance that environmental governance is maintained even where applications are of an administrative nature, thereby supporting regulatory integrity and upholding public confidence in the EA system.

2 CONTACT PERSON AND CORRESPONDENCE ADDRESS

2.1 Details of the Applicant

The contact details of the Applicant are provided in Table 2-1.

Table 2-1: Applicant Details

Name of Applicant:	Sibanye Gold Proprietary Limited
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2.2 Details of the Environmental Assessment Practitioner

The contact details of the EAP are provided in Table 2-2 below.

Table 2-2: Contact Details of the Environmental Assessment Practitioner

Name of Environmental Assessment Practitioner:	Paula Jane Tolksdorff
Professional Affiliation / Registration:	Professional affiliation/registration: Environmental Assessment Practitioners Association of South Africa (EAPASA) (2019/509) South African Council for Natural Scientific Professions (SACNASP) (152904) International Association for Impact Assessment South Africa (1745) International Association Public Participation (IAP2SA014)
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2.3 Expertise of the Environmental Assessment Practitioner

This section provides the qualifications and experience of the EAP. The EAP's Curriculum Vitae and qualifications are attached in Appendix A.

Paula Tolksdorff holds the following qualifications:

- National Diploma: Civil Engineering, University of the Witwatersrand, 1993.
- National Higher Diploma: Civil Engineering, University of the Witwatersrand, 1994.
- Baccalaureus Technologiae (B-Tech), Engineering Civil, Urban and Rural Development, University of the Witwatersrand, 1997.
- MSc. Environmental Management, University of North-West (two years course work complete 2011/2012).

2.3.1 Summary of the Environmental Assessment Practitioner's Past Experience

Paula brings over 30 years of specialised experience in the environmental sector, working across various industries, including global industrial and mining clients, as well as commercial developments. Her career has taken her through significant projects across Africa, where she has gained a deep understanding of how environmental and social licences to operate impact both operations and project outcomes.

With a strong foundation in sustainability, Paula applies her expertise to integrate and maintain effective, sustainable practices across a wide range of operational contexts. As an EAP and Professional Natural Scientist, her skills are both robust and multifaceted. She excels in conducting environmental and social (E&S) impact assessments and in developing comprehensive E&S management programmes tailored to the specific needs of each project. Her work includes crafting and implementing E&S management systems for both construction and operational phases, ensuring they adhere to international standards, as well as local regulatory requirements.

Paula is also highly experienced in stakeholder engagement, ensuring clear communication and collaboration across all parties involved in a project. Her capabilities extend to due diligence and compliance auditing, where she provides critical oversight to ensure regulatory compliance and operational integrity. Additionally, she has extensive experience managing water and waste resources, promoting responsible and sustainable practices.

Through her well-honed project management skills, Paula effectively leads complex projects, consistently ensuring that sustainability goals are met. Her career and diverse background demonstrate a deep commitment to advancing environmental stewardship and sustainable development across challenging and diverse environments.to advancing environmental stewardship and sustainable development across challenging and diverse environments.

Professional Affiliations:

- Environmental Assessment Practitioners Association of South Africa (EAPASA) (2019/509).
- South African Council for Natural Scientific Professions (SACNASP) (152904).
- International Association for Impact Assessment South Africa (1745).

International Association Public Participation (IAP2SA014).

2.4 Expertise of the Project Team

The expertise of the project team is tabulated below in Table 2-3, which outlines each team member's name, role, qualifications, years of experience, and professional registrations (where applicable).

Table 2-3: Expertise of the Project Team

Name	Title	Qualifications	Experience
Luyanda Macheke	Environmental Consultant	Postgraduate Diploma in Integrated Water Management, University of the Free State (2024) BSc in Geography and Geology, University of Johannesburg (2021)	2+ years
Anelle Lotter	Stakeholder Engagement Practitioner	National Diploma: Journalism	25+ years
Sibongile Bambisa-Moropodi	Stakeholder Engagement Practitioner	Honours: Anthropology	15+ years

3 LOCATION OF THE OVERALL ACTIVITY

The existing Beatrix MR (FS 10047 MR (FS 081 MR)), which comprises both the Beisa and Beatrix areas as illustrated in Figure 3-1, is situated in the Free State Province within the Lejweleputswa District Municipality. The MR area falls under the jurisdiction of both the Matjhabeng and Masilonyana Local Municipalities. Geographically, the MR lies approximately 25 kilometres south of Virginia, about 40–45 km southeast of Welkom, 25–30 km east of Hennenman, 35–40 km northeast of Theunissen, 45–50 km north of Winburg, around 70 km northeast of Brandfort, 50 km southeast of Odendaalsrus, and roughly 60 km southwest of Ventersburg.

The future Beatrix MR, which is the subject of this application, will consist of Beatrix 4 Shaft and its associated supporting infrastructure, also referred to as the Beisa Project / Operation, as illustrated in Figure 3-2.

3.1 Locality Map

The future Beatrix MR, which is the subject of this application, will consist of Beatrix 4 Shaft and its associated supporting infrastructure, also referred to as the Beisa Project / Operation, as shown in Figure 3-2.

3.2 Location and Farm Portions

Table 3-1 details the location of the overall activity, including the details of the farm portions included in the application as illustrated in Figure 3-3.

Table 3-1: Proposed Project Locality Details

<table>
<tr><td>Farm name</td><td>Annex Glen Ross 562 portion 9
Boschluis Spruit 278 portion 1
Kalkoenkrans 225 portion 1
Kalkoenkrans 225 portion 2
Kalkoenkrans 225 portion 4
Kalkoenkrans 225 portion 6
Kalkoenkrans 225 portion RE
Palmietkuil 328 portion 1
Palmietkuil 328 portion 4
Palmietkuil 328 portion 5
Palmietkuil 328 portion 6
Palmietkuil 328 portion RE</td></tr>
<tr><td>Application area (ha)</td><td>Approximately 5914.10 ha</td></tr>
<tr><td>Magisterial district</td><td>Situated Free State Magisterial District of Theunissen.</td></tr>
<tr><td>Distance and direction from nearest town</td><td>The mining right lies approximately 25 km south of Virginia, about 40–45 km southeast of Welkom, 25–30 km east of Hennenman, 35–40 km northeast of Theunissen, 45–50 km north of Winburg, around 70 km northeast of Brandfort, 50 km southeast of Odendaalsrus, and roughly 60 km southwest of Ventersburg.</td></tr>
<tr><td>21. digit Surveyor General Code for each farm portion</td><td><table>
<tr><td>Farm</td><td>Surveyor General Code</td></tr>
<tr><td>Annex Glen Ross 562 portion 9</td><td>F03300000000056200009</td></tr>
<tr><td>Boschluis Spruit 278 portion 1</td><td>F03300000000027800001</td></tr>
<tr><td>Kalkoenkrans 225 portion 1</td><td>F03300000000022500001</td></tr>
<tr><td>Kalkoenkrans 225 portion 2</td><td>F03300000000022500002</td></tr>
<tr><td>Kalkoenkrans 225 portion 4</td><td>F03300000000022500004</td></tr>
<tr><td>Kalkoenkrans 225 portion 6</td><td>F03300000000022500006</td></tr>
<tr><td>Kalkoenkrans 225 portion RE</td><td>F03300000000022500000</td></tr>
<tr><td>Palmietkuil 328 portion 1</td><td>F03300000000032800001</td></tr>
<tr><td>Palmietkuil 328 portion 4</td><td>F03300000000032800004</td></tr>
<tr><td>Palmietkuil 328 portion 5</td><td>F03300000000032800005</td></tr>
<tr><td>Palmietkuil 328 portion 6</td><td>F03300000000032800006</td></tr>
<tr><td>Palmietkuil 328 portion RE</td><td>F03300000000032800000</td></tr>
</table></td></tr>
</table>

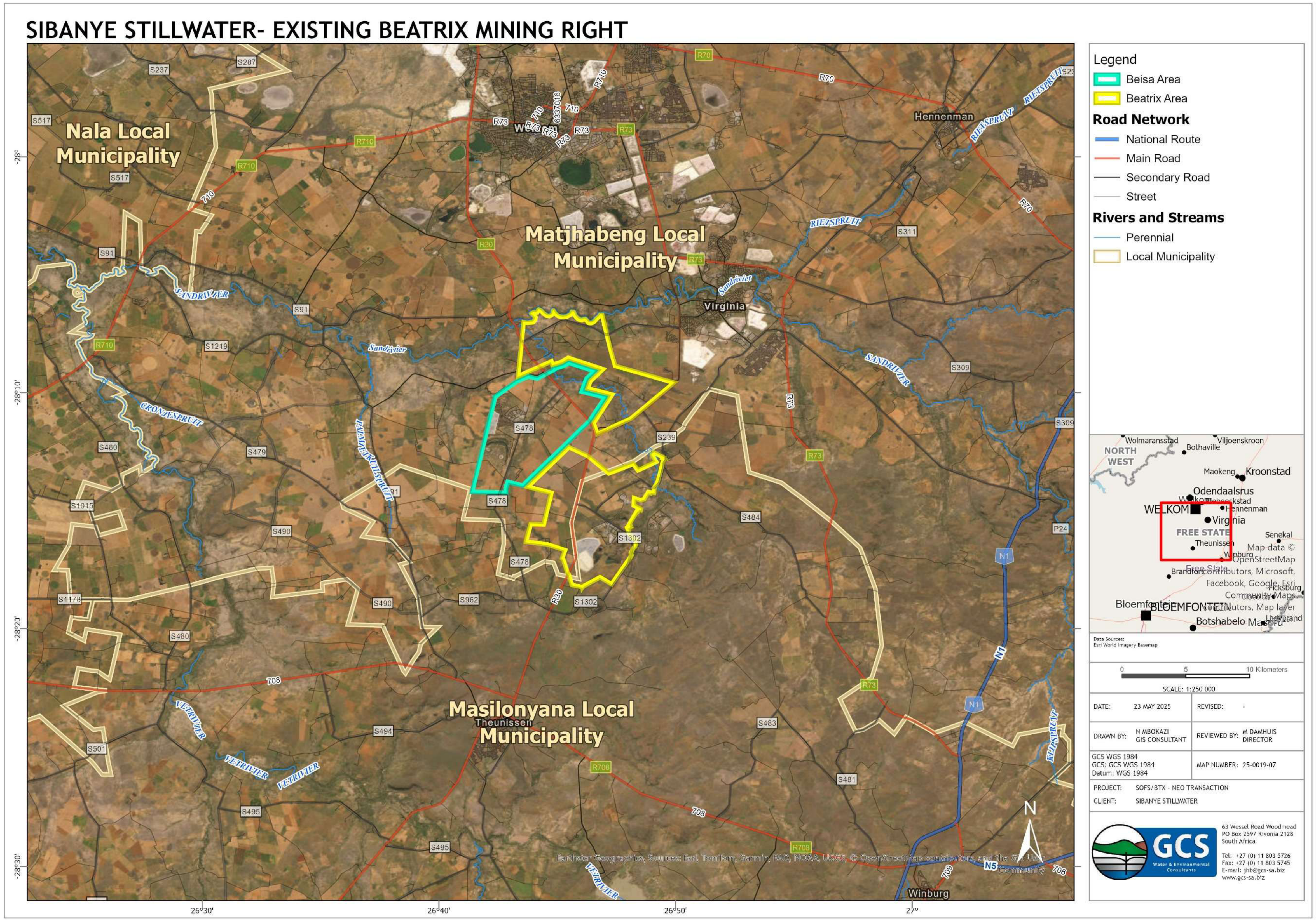


Figure 3-1: Regional Locality of the Existing Beatrix Mining Right (Beisa and Beatrix Areas) (FS 10047 MR (FS 081 MR))

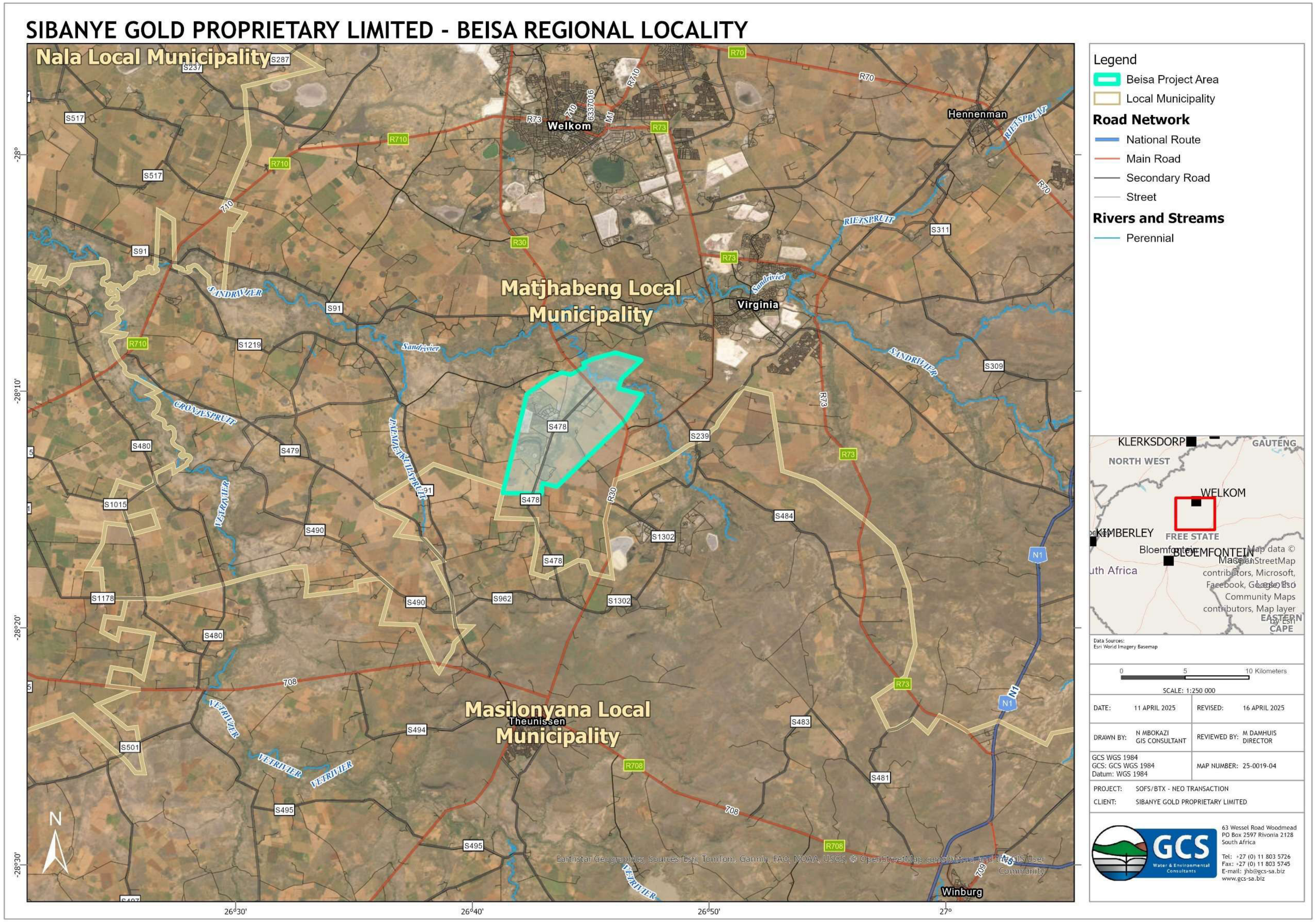
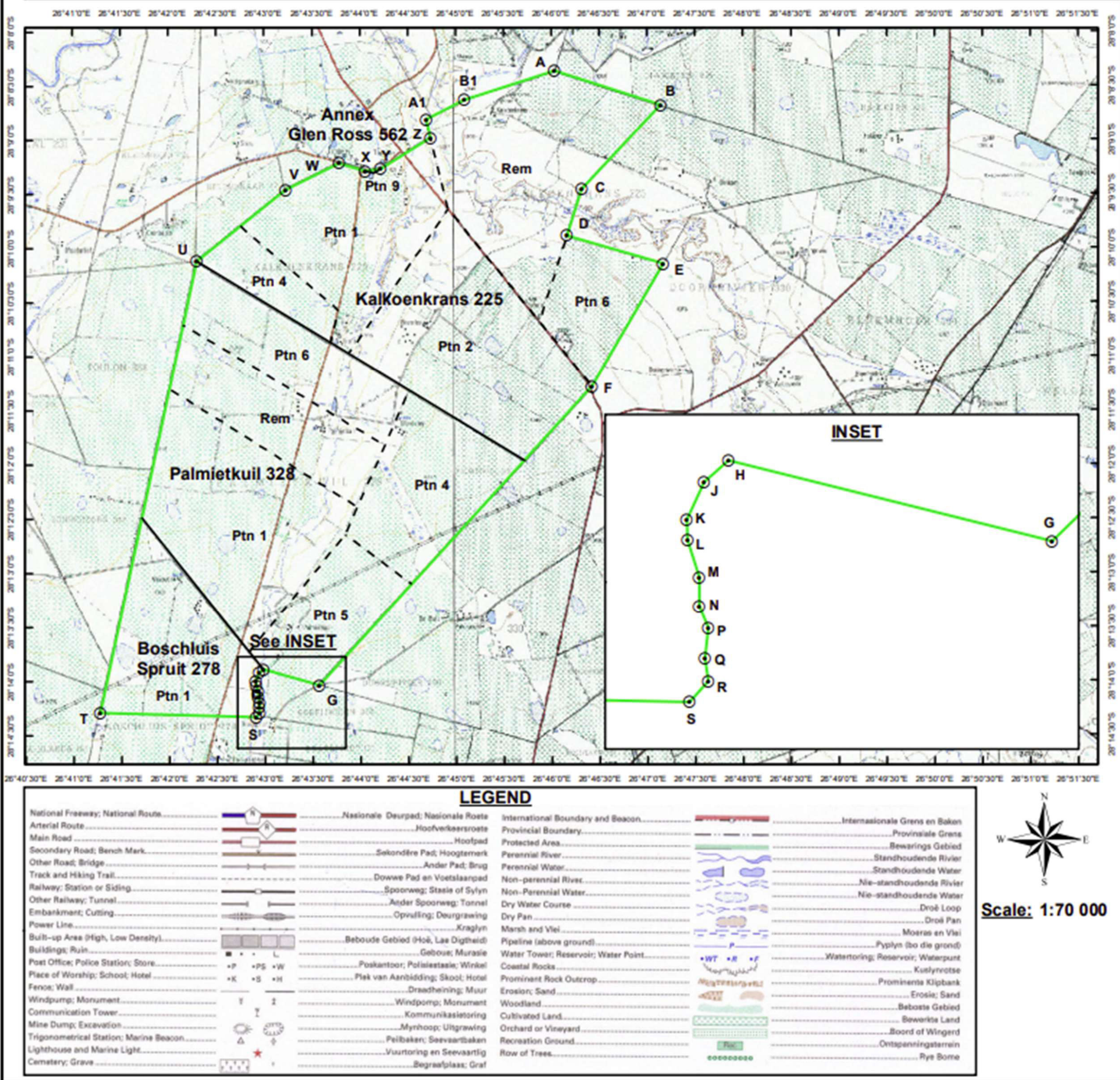


Figure 3-2: Regional Locality of the Future Beatrix Mining Right (Beisa Project / Operation) (FS 10047 MR (FS 081 MR))

SKETCHPLAN as prescribed by Regulation 2 (2) of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)



CO-ORDINATES (WGS 84)

Name	Lat(S)	Lon(E)
A	-28.139339	26.767315
B	-28.144580	26.785699
C	-28.157690	26.771982
D	-28.164814	26.769403
E	-28.169057	26.786186
F	-28.188032	26.773749
G	-28.233971	26.726171
H	-28.231537	26.716384
J	-28.232197	26.715637
K	-28.233318	26.715122
L	-28.233944	26.715132
M	-28.235075	26.715484
N	-28.235938	26.715491
P	-28.236595	26.715758
Q	-28.237514	26.715662
R	-28.238207	26.715768
S	-28.238842	26.715210
T	-28.238236	26.687975
U	-28.168635	26.704959
V	-28.157692	26.720412
W	-28.153554	26.729702
X	-28.154744	26.734368
Y	-28.154427	26.737021
Z	-28.149712	26.745730
A1	-28.146772	26.744928
B1	-28.143772	26.751662

DESCRIPTION OF RIGHT

The figure lettered ABCDEFGHJKLMNPQ RSTUVWXYZA1B1 represents a Prospecting Right area in the extent approximately 5914.10 ha, situated on the Remaining Extent, Ptn 1, 2, 4 and 6 of the farm Kalkoenkrans 225, the Remaining Extent, Ptn 1, 4, 5 and 6 of the farm Palmietkuil 328, Ptn 1 of the farm Boschluis Spruit 278 and Ptn 9 of the farm Annex Glen Ross 562, situated in the Magisterial District of Theunissen.

Applicant
Neo Uranium Resources Beisa Mine (Pty) Ltd
Reg. No. 2024/423241/07

____

Date

____

Department Mineral Resources
Regional Manager
Free State Region

Date

Compiled from SG Diagrams by me

____

H Husselmann
Certificated Mine Surveyor 1832

DATE: 9 Apr 2025

FILE: Boschluis Spruit 278

Figure 3-3: Farm Portions that comprise of the Future Beatrix Mining Right (Beisa Project / Operation) (FS 10047 MR (FS 081 MR))

4 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

4.1 Existing Authorisations

Sibanye Gold holds the following authorisations:

- Beatrix MR (FS 10047 (FS 081 MR)).
- Beatrix Water Use Licence (WUL) 08/C42K/AEFJG/8739, dated 31 October 2018 and the subsequent amendment of 2021.
- Beatrix Atmospheric Emissions Licence, LDM/AEL/LRC/004, dated 5 November 2018.
- Beatrix (Oryx) Waste Permit, 16/2/7/C404/C6/Z1/P328, dated 21 August 2000.
- Beatrix Waste Permit, 16/2/7/C404/C4/Z1/P89, dated 7 June 2005.
- Beatrix Waste Management Licence (WML), FS 30/5/1/2/3/2/1/81 EM; dated 5 June 2018.

4.2 Required Authorisations

In terms of the NEMA, read together with the EIA Regulations, 2014, an EA is required for the following listed activity:

- GN R 983 (Listing Notice 1), Activity 21D: 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.

As such, a BA process must be undertaken in accordance with the procedures set out in the EIA Regulations, 2014.

4.3 Listed and Specified Activities

Table 4-1 below provides details of the listed activity that forms the basis of this application for authorisation.

Table 4-1: Listed Activity to be Authorised under the National Environmental Management Act, 1998

Name of Activity	Aerial Extent of Activity (hectares (ha) or square metres (m^2))	Listed Activity	Applicable Listing Notice	Listed Activity Description as per Regulations / Notice
An amendment is required to the Mining Right FS 10047 MR (FS 081 MR)	Approximately 5914.10 ha	Activity 21 D	Listing Notice 1 (GN R 983)	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.

5 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN

The Beisa Operation forms part of the Beatrix MR (FS 10047 MR (FS 081 MR)) and is supported by a range of existing infrastructure. This section provides an overview of the activities and facilities that will be undertaken and/or recommissioned, based on the Mining Works Programme prepared by Sibanye Gold (Sibanye , 2025).

5.1 Mining

5.1.1 Mining Methodology

The Beisa Operation forms part of the Beatrix 4 Shaft complex, located within the Free State Goldfields of the Witwatersrand Basin. Mining activities are focused on the Beisa Reef, which contains both gold and uranium, as well as associated reefs such as the Kalkoenkrans Reef. Stoping is undertaken at depths ranging from approximately 580 metres (m) to 2,155 m below surface, which is characteristic of deep-level gold and uranium mining in South Africa. The primary mining methods include conventional scattered mining layouts for discrete ore blocks and remnant block extraction to recover payable ore from historically mined areas. These methods are selected to optimise ore recovery, maintain stability, and ensure safe operations under varying geotechnical conditions. Ore is drilled, blasted, and transported via ore passes and conveyors to surface silos for further processing.

5.1.2 Shaft Systems

Access to the ore bodies is facilitated by an integrated shaft system. The Beisa Shaft provides access to the Beisa Reef to a depth of 1,071.5 m, while the main sub-vertical shaft provides deeper access to the Kalkoenkrans Reef. Ventilation and service support are provided through the 4 Vent Shaft, 4B Vent Shaft, and MSV Vent Shaft. These shafts are equipped with headgears, winding systems, and hoisting infrastructure that allow for the movement of ore, personnel, and materials. The shafts are also fitted with emergency egress facilities and service connections, ensuring operational continuity and compliance with safety regulations.

5.1.3 Underground Infrastructure

The underground mine workings are supported by extensive engineering infrastructure designed to facilitate deep-level mining. This includes cross-cut haulages, declines, and footwall haulage levels that provide access to stoping areas. Ore and waste are managed via a system of ore passes, loading bins, and conveyor belts, which transport material to central loading stations. Pump stations and water dams are installed at strategic locations to manage significant fissure water inflows, while extensive primary and secondary ventilation networks ensure adequate air circulation. Compressed air and hydropower reticulation systems supply energy for rock drills, support installation, and cooling systems. This integrated network ensures operational safety and efficiency at depth.

5.1.4 Surface Mining Support Facilities

On surface, a comprehensive suite of infrastructure supports the underground operations. Facilities include headgears and winding houses, primary ventilation fans, lamp rooms, change houses, offices, and training centres. Accommodation facilities are provided for employees, and surface workshops and supply depots are available for the maintenance and repair of critical mining equipment. In addition, refrigeration plants and surface pumping stations are linked to underground systems, ensuring that safe working conditions are maintained throughout the mine.

5.1.5 Waste Rock Dumps

Waste rock generated from development and stoping activities is hoisted to surface and placed in engineered waste rock dumps (WRDs). The Beisa Rock Dump, located at 4 Shaft, is the primary facility for waste rock disposal. It is designed to accommodate large volumes of inert waste material and includes engineered features such as stormwater diversion channels, dust suppression systems, and berms to manage environmental impacts. Waste rock material is not solely discarded; it also serves as a supplementary feedstock for the processing plant. The Beatrix No.2 Plant reprocesses surface waste rock dump material to recover residual gold, thereby reducing the long term footprint of the WRD. The life of mine (LoM) plan determines the proportion of WRD material to underground ore processed annually, ensuring sustainable management of both resource and waste streams.

5.1.6 Tailings Storage Facilities

In addition to WRDs, mine residue from processing is deposited in tailings storage facilities (TSFs) associated with 4 Shaft. Two active compartmentalised TSFs are operated to contain slurried tailings from both the gold and uranium recovery circuits. The TSFs are designed to meet geotechnical and environmental standards, incorporating seepage management systems, dust suppression measures, and stability monitoring infrastructure. These facilities form a critical component of the mine's waste management strategy.

5.2 Processing

5.2.1 Beatrix No.2 Plant

The Beatrix No.2 Plant, formerly known as the Oryx Plant, is located east of 4 Shaft. Commissioned in 1992 and recommissioned in 1996, the facility has since been upgraded to process both underground ore and surface waste material. The plant is fed from four ore silos with a combined dry ore capacity of 16,800 tonnes. Ore is delivered via shaft conveyors or truck haulage to the plant feed system.

The milling circuit consists of four autogenous Run-of-Mine (RoM) mills, each powered by a 2 megawatt (MW) motor. Downstream processing includes three 50-m thickeners, eight mechanically agitated leach tanks with a combined volume of 13,000 cubic metres (m^3), and an eight-stage carousel-type carbon adsorption circuit. Loaded carbon is treated in a pressure Zadra elution circuit designed to process 10 tonnes of carbon per day. Regeneration occurs in two rotary kilns, and final gold recovery is achieved through electro-winning and smelting into doré bars.

Reagent storage is provided on-site for dry lime, sodium cyanide, caustic soda, hydrochloric acid, and fuel. The plant was originally designed for 112,000 tonnes per month (ktpm), but capacity was increased to 130 ktpm following the addition of a fourth milling circuit in 1996. The plant is mechanically and structurally in good condition and subject to ongoing maintenance, is sufficient to meet the LoM requirements.

5.2.2 Waste Rock Reprocessing

In addition to underground ore, the Beatrix No.2 Plant processes material from the Beisa Rock Dump. This enables recovery of residual gold from previously discarded material, effectively turning waste into a secondary resource. Reprocessing contributes to reducing the environmental footprint of the WRD, while providing a consistent feedstock to the plant. The ratio of waste rock to underground ore processed is controlled by the LoM plan, balancing plant capacity, ore availability, and waste management objectives.

5.2.3 Toll Treatment Capacity

The Beatrix No.2 Plant also has the capacity to toll treat third-party material, subject to the availability of excess plant capacity. This provides operational flexibility and the opportunity for additional revenue generation without impacting the mine's internal production requirements.

5.3 Supporting Surface Infrastructure

5.3.1 Roads and Access

The Beisa Operation is situated approximately 240 km southwest of Johannesburg and close to the towns of Welkom, Virginia, and Theunissen. Access to the site is via the N1 highway, which links Johannesburg and Kroonstad, and the R34 regional route, which provides direct connectivity to the mine. The area benefits from a mature network of arterial and secondary roads developed during decades of mining activity, ensuring reliable access for personnel, materials, and heavy equipment.

5.3.2 Power Supply

Electrical power is provided by Eskom via a 132 kilovolt (kV) transmission network connected through the Theseus substation. The Beatrix Operation is supplied through five points of distribution. The mine has an installed capacity of 260 megavolt (MV) and a notified maximum demand of 128.8 MV, with an average consumption of approximately 74.3 MV. Supplementary electricity is generated on-site through a methane-to-electricity project, contributing approximately 1 MW to the energy supply. Energy efficiency projects are actively pursued to reduce reliance on the grid, particularly focusing on optimising ventilation and water pumping systems, which represent significant energy demands.

5.3.3 Water Supply and Management

5.3.3.1 Vaal Central Water Supply

Beatrix Mine sources its potable water from Vaal Central Water, located at Balkfontein. Raw water is abstracted from the Vaal River and treated at the Balkfontein works through filtration, sedimentation, and chlorination to meet required standards for domestic and industrial use.

The treated water is supplied via a bulk pipeline system that runs from the north-western boundary of the mine to Beatrix Mine and Joel Mine in the east, and along the western boundary to the Leeubult Reservoirs in the south. This network ensures a continuous and reliable supply of water to support mining and related operations.

5.3.3.2 Mine Water

Mine water management is essential due to significant fissure water ingress. On average, 24 megalitres per day (Ml/d) can be pumped from underground to prevent flooding of shafts and working areas, however no pumping of is currently taking place Each shaft complex is equipped with independent pumping systems to provide redundancy and operational resilience.

The fissure water is naturally saline and not authorised for discharge; it is therefore contained in shallow evaporation dams. Additional emergency infrastructure, including high-capacity pumps and containment dams, is maintained to manage sudden inflows, reduce flood risks, and safeguard workers and equipment.

5.3.3.3 Treated sewage effluent

The wastewater treatment works at Beatrix 4 Shaft is registered with the Department of Water and Sanitation (DWS) as a Class C facility. Sewage is treated using an activated sludge extended aeration process, producing effluent of a quality suitable for irrigation of gardens and sports fields, or for discharge into local watercourses (Theron and Boschluis Spruits) in line with existing authorisations.

5.3.4 Ancillary Facilities and Services

A wide range of ancillary facilities supports the operation. These include compressed air stations, refrigeration plants, pumping stations, and surface workshops for equipment maintenance. Office buildings, training centres, and accommodation facilities are provided for employees. Collectively, these facilities ensure that the Beisa Operation is able to meet operational demands, comply with environmental and safety regulations, and support the wellbeing of its workforce.

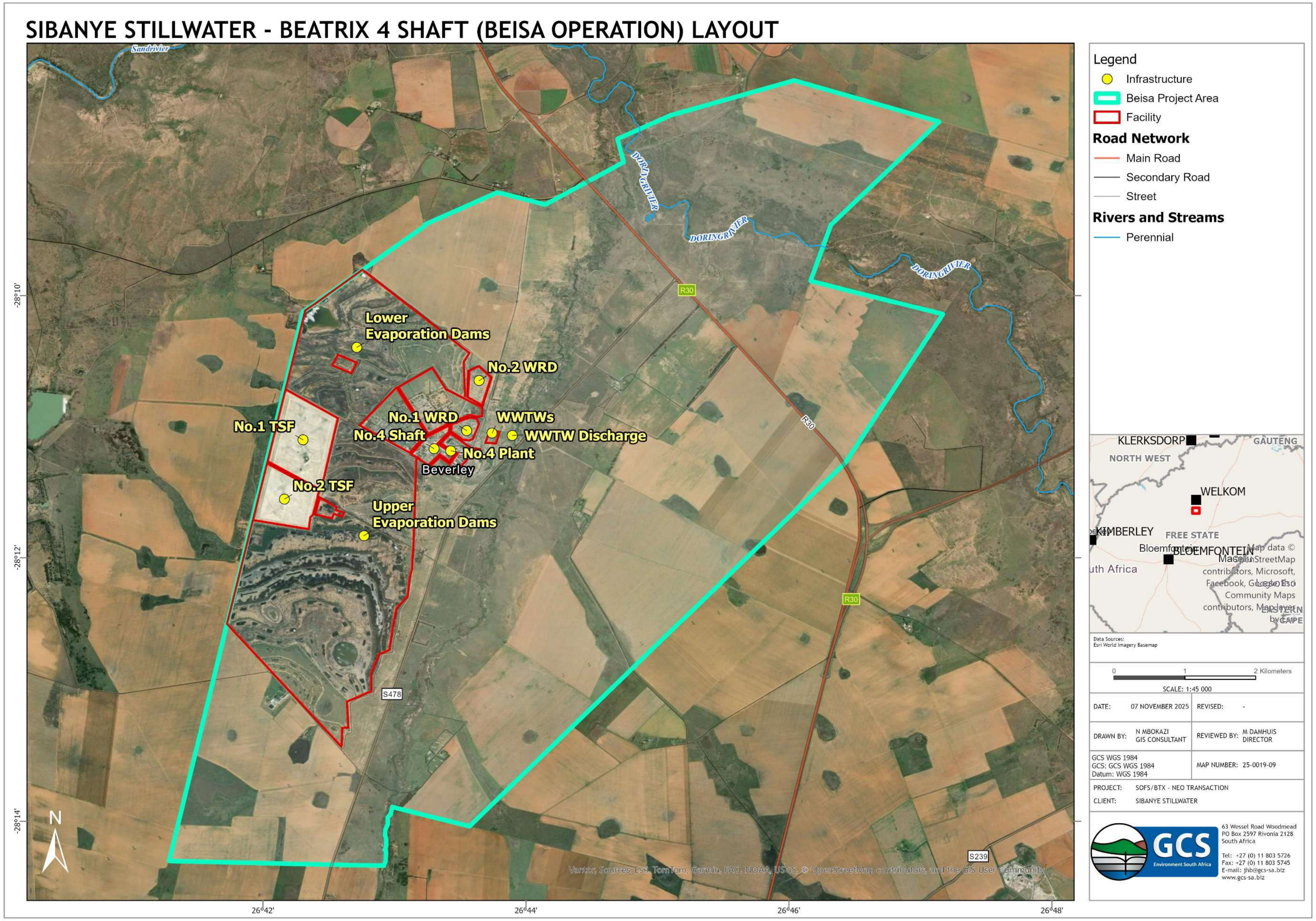


Figure 5-1: Layout map of Beatrix 4 Shaft (Beisa Operation)

6 POLICY AND LEGISLATIVE CONTEXT

The South African environmental regulatory framework was promulgated with the aim of environmental protection. The regulatory framework provides requirements and guidelines for E&S management. Table 6-1 provides a list of applicable legislative requirements, guidelines as well as a description of how the project complies with and responds to the policy and legislation context.

Table 6-1: Applicable Legislation, Policies and Guidelines Applicable to the Proposed Project

Applicable Legislation and Guidelines used to compile the Report	Description	Reference where applied in Report	Applicability
Legislation			
Chapter 2, section 24 and section 32 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996).	Chapter 2 of the Constitution is the cornerstone of democracy in South Africa. The Chapter enshrines the rights of all people living in South Africa and affirms the democratic values of human dignity, equality and freedom. Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or wellbeing; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that - • Prevent pollution and ecological degradation; • Promote conservation; and • Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. Section 24 guarantees the protection of the environment through reasonable legislative (and other measures), and such legislation is continuously in the process of being promulgated. Section 32 provides for access to information, held by any person or organ of state, where such information is required to exercise or protect the rights of any other person. The Promotion of Access to Information Act (Act No. 2 of 2000) gives effect to the provisions of this right.	This report was prepared, submitted and considered within the constitutional framework.	A Basic Assessment (BA) process has been undertaken to identify and assess potential impacts associated with the project. Mitigation measures and monitoring measures as provided in this report have been recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). Mineral and Petroleum Resources Development Regulations (GN R 527 of 2004, as amended) [1].	The MPRDA makes provision for equitable access to and sustainable development of the nation's mineral and petroleum resources; and to provide for matters connected therewith. The Act also aims to ensure the promotion of economic and social development through exploration and mining-related activities. The Act prohibits any person from conducting mining and petroleum operations except with prior Environmental Authorisation. The Minister of Mineral Resources and Energy is responsible for implementing environmental provisions relating to the mining or petroleum operations in terms of the NEMA. The Act requires that mining companies assess the socio-economic impacts of their activities from start to closure and beyond. Companies must develop and implement a comprehensive Social and Labour Plan (SLP) to promote socio-economic development in their host communities and to prevent or lessen negative social impacts.	This report.	Sibanye Gold holds Beatrix Mining Right (MR) (FS 10047 (FS 081 MR)). The BA will be compiled in accordance with the MPRDA read with the Environmental Impact Assessment (EIA) Regulations, 2014.
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)[2]. • Environmental Impact Assessment (EIA) Regulations, 2014 (Government Notice Regulation (GN R) 982 of 2014, as amended in June 2021)3. • EIA Regulations Listing Notice 1 of 2014 (GN R 983 of 2014, as amended)4. • EIA Regulations Listing Notice 2 of 2014 (GN R 984 of 2014, as amended)[5]. EIA Regulations Listing Notice 3 of 2014 (GN R 985 of 2014, as amended)[6].	The NEMA can be regarded as the most important piece of general environmental legislation. The overarching principle of the Act is sustainable development. It defines sustainability as meaning the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure the development serves present and future generations. The Act provides a framework for environmental law reform and covers three areas, namely: • Land, planning and development; • The use and conservation of natural and cultural resources; and • Pollution control and waste management. Section 24 of the NEMA sets out the provisions which are to give effect to the general objectives of Integrated Environmental Management (IEM) and laid down in Chapter 5 of the NEMA. In terms of Section 24(1), the potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the Competent Authority (CA) charged by the NEMA with granting of the relevant EA. In terms of Section 24F(1) of the NEMA no person may commence an activity listed or specified in terms of Section 24(2)(a) or (b) unless the CA has granted an EA for the activity.	This report.	The BA process will be undertaken in compliance with the NEMA requirements read with the EIA Regulations, 2014. In terms of Section 24(1) of the NEMA, the potential consequences for or impacts on the environment of inter alia 'listed activities' must be considered, investigated, assessed and reported on to the Minister responsible for mineral resources, except in respect of those activities that may commence without having to obtain an EA in terms of the NEMA. As such, an application for EA in terms of NEMA 'listed activities' as contemplated in GN R 983, will be submitted to the Department of Mineral and Petroleum Resources (DMPR). The listed activities which are potentially triggered under the Listing Notices are provided in Table 4-1of this Report.

[1] GN 527 in GG 26275 of 23 April 2004 as amended by GN R 1288 in GG 26942 of 29 October 2004; GN R 1203 in GG 29431 of 30 November 2006; GN R349 in GG 34225 of 18 April 2011; GN R466 in GG 38855 of 3 June 2015; and GN R420 in GG 43172 of 27 March 2020.

[2] The National Environmental Laws Amendment Act, 2022 (Act No 2 of 225022) was signed into law on 24 June 2022. Except for sections 11, 35(a), 57, 60, 61(c), 61(j), 61(k), 62, 63, 64, 65, 66, 72, 76, 77, 86, 87 and 88 pertaining mostly to changes to the NEMWA, the NEMLAA came into effect on 30 June 2023 as per Proclamation Notice 125 of 2023, published in GG 48869.

[3] GN R982 of 4 December 2014 as amended by GN R326 of 7 April 2017, GN 706 of 13 July 2018, GN 599 of 29 May 2020 and GN 517 of 11 June 2021.

[4] GN R 983 in GG 38282 of 4 December 2014 as amended by GN R327 in GG 40772 of 7 April 2017, GN 706 in GG 41766 of 13 July 2018 and GN 517 in GG 44701 of 11 June 2021.

[5] GN R 984 in GG 38282 of 4 December 2014, as amended by GN R325 in 40772 of 7 April 2017 and GN 517 in GG 44701 of 11 June 2021.
[6] GN R 985 in GG 38282 of 4 December 2014, as amended by GN R324 in 40772 of 7 April 2017, GN 706 in GG 41766 of 13 July 2018 and GN 517 in GG 44701 of 11 June 2021.

Applicable Legislation and Guidelines used to compile the Report	Description	Reference where applied in Report	Applicability
	The Minister published the EIA Regulations comprising the EIA Regulations GN R 982, and three Listing Notices namely GN R 983 (Listing Notice 1), GN R 984 (Listing Notice 2) and GN R 985 (Listing Notice 3) in terms of sections 24(2) and 24D of the NEMA. The Regulations make provision for the regulation of the procedure and criteria as contemplated in Chapter 5 of the Act relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for EA for the commencement of activities, subjected to EIA, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.		This report outlines the impacts associated with the activities and the proposed measures in which to mitigate and manage the impacts including the monitoring programme.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA)[7]. • List of waste management activities that have, or are likely to have, a detrimental effect on the environment (GN 921 of 2013, as amended)[8]. • National Waste Information Regulations, 2012 (GN R 625 of 2012)9. • Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 (GN R632 of 2015, as amended)10. • Waste Classification and Management Regulations, 2013 (GN R634 of 2012)11. • National Norms and Standards for the Assessment of Waste for Landfill Disposal (R635 of 2012)12. • National Norms and Standards for the Disposal of Waste to Landfill (R636 of 2012)13. • National Norms and Standards for the Storage of Waste (GN 926 of 2013)14. • National Norms and Standards for the Remediation of Contaminated Land and Soil Quality – GN 331 in Government Gazette No. 37603 dated 2 May 2014.	The NEMWA commenced on 1 July 2009 and as a result of its commencement the relevant provisions in the Environment Conservation Act, 1989 (Act No. 73 of 1989) (ECA) in respect of waste management, were repealed. The Act sets out to reform the law regulating waste management and deals with waste management and control more comprehensively than was dealt with in the ECA. It also introduces new and distinct concepts never canvassed within the realm of waste management in South Africa, such as the concept of contaminated land and extended producer responsibility. It also provides for more elaborate definitions to assist in the interpretation of the Act. In terms of section 19(1) of the NEMWA, the Minister, published in GN R 921, a list of waste management activities that have, or are likely to have a detrimental effect on the environment. Section 20 of the NEMWA pertains to the consequences of listed waste management activities and states that no person may commence, undertake or conduct a waste management activity, except in accordance with the requirements or standards for that activity as determined by the Minister or in accordance with a waste management licence issued in respect of that activity, if a licence is required. In accordance with section 19(3), the Schedule to GN R.921 provides that a waste management licence is required for those activities listed in Category A and B thereof and compliance with the Norms and Standards is required for those activities listed in Category C thereof prior to the commencement, undertaking or conducting of same. In addition, GN R.921 differentiates between Category A, B, and Category C waste management activities. Category A waste management activities are those which require the conducting of a BA process as stipulated in the EIA Regulations 2014, as amended, (GN R982) promulgated in terms of the NEMA as part of the waste management licence application and Category B waste management activities are those that require the undertaking of a Scoping and Environmental Impact Assessment process stipulated in the GN R.982 as part of the waste management licence application. Category C waste management activities do not require a waste management licence, however a person who wishes to commence, undertake or conduct a waste management activity listed under this category, must comply with, amongst others, the relevant National Norms and Standards for the Storage of Waste (GN R.926 of 29 November 2013) published in terms of the NEMWA.	Section 4.1.	Sibanye Gold is currently in possession of the following waste-related licences: • Beatrix (Oryx) Waste Permit: 16/2/7/C404/C6/Z1/P328. • Beatrix Waste Permit: 16/2/7/C404/C4/Z1/P89. • Beatrix Waste Management Licence (WML): FS 30/5/1/2/3/2/1/81 EM. These licences govern waste management and ensure that all waste-related activities at Beatrix are undertaken in accordance with applicable legal and environmental requirements.
National Water Act, 1998 (Act No. 36 of 1998) (NWA). • Regulations on the use of water for mining and related activities aimed at the protection of water resources (GN R 704 of 1999)[15].	The national government, acting through the Minister of Water and Sanitation (previously the Minister of Water Affairs), is the public trustee of South Africa's water resources, and must ensure that water is protected, used, developed, conserved, managed, and controlled in a sustainable and equitable manner for the benefit of all persons (section 3(1)).	Section 4.1. Section 12.5. Section 12.6. Section 12.7. Part B.	Sibanye Gold is currently in possession of the Beatrix WUL, 08/C42K/AEFJG/8739, dated 31 October 2018 and the subsequent amendment of 2021., which governs the water uses in the specified area. Ongoing compliance with this licence and all applicable provisions of the NWA is mandatory.

[7] As amended by the National Environmental Management: Waste Amendment Act 26 of 2014. As stated above, the National Environmental Laws Amendment Act, 2022 (Act No 2 of 2022) was signed into law on 24 June 2022 and will come into operation on a date to be fixed and proclaimed by the President. Once the amendment act comes into operation residue stockpiles and residue deposits will be removed from NEMWA and regulated in terms of the provisions of NEMA. Residue stockpiles and residue deposits will therefore no longer be regarded as waste for which a waste management licence is required. Residue stockpiles and residue deposits will in future be authorized in terms of the NEMA under the EIA Listing Notices. In terms of the transitional provisions any approval granted, or waste management licence issued in relation to residue deposits and residue stockpiles remain valid until it lapse or replaced under the provisions of the NEMA.
[8] GN 921 in GG 37083 of 29 November 2013 as amended by GN 332 in GG 37604 of 2 May 2014; GN R633 in GG 39020 of 24 July 2015; and GN 1094 in GG 41175 of 11 October 2017.
[9] GN R 625 in GG 35583 of 13 August 2012.
[10] GN R 632 in GG 39020 of 24 July 2015 as amended by the Planning and Management of Residue Stockpiles and Residue Deposits Amendment Regulations, 2018 published under GN 990 in GG 41920 of 21 September 2018. Once the relevant sections in the National Environmental Laws Amendment Act, 2022 (Act No 2 of 2022) comes into effect, residue stockpiles and residue deposits will be excluded from NEMWA and will be regulated in terms of the provisions of NEMA. The Residue Regulations will remain operational and will be deemed to have been made under NEMA.
[11] GN R634 in GG 36784 of 23 August 2012.
[12] R635 in GG 36784 of 23 August 2012.
[13] R636 in GG 36784 of 23 August 2012.
[14] GN 926 in GG 37088 of 29 November 2013.
[15] GN R 704 in GG 20119 of 4 June 1999.

Applicable Legislation and Guidelines used to compile the Report	Description	Reference where applied in Report	Applicability
• Water Use Licence Application and Appeals Regulations, 2017 (GN R 267 of 2017)[16]. • Regulations regarding the safety of dams in terms of section 123(1) of the NWA (GN R139 of 2012)[17]. General Authorisations: • General Authorisation: 21(c) and (i) water use for the purpose of rehabilitating a wetland for conservation purposes (GN 1198 of 2009)[18]. • General Authorisation: 21(c) and (i) water uses (GN 509 of 2016)[19]. • Revision of General Authorisation for the Taking and Storing of Water (GN 538 of 2016)[20]. • Revision of General Authorisation in terms of section 39 of the National Water Act 36 of 1998 (GN 665 of 2013)[21].	Section 19 of the NWA places an obligation on landowners, persons in control of land, occupants of land and land users of land on which: Any activity or process is or was performed or undertaken; or Any other situation exists, which causes, has caused or is likely to cause pollution of a water resource, to take all reasonable measures to prevent any such pollution from occurring, continuing, or recurring. In terms of the NWA a person may only use water without a licence under certain circumstances. All other use, provided that such use qualifies as a use listed in section 21 of the Act, require a Water Use Licence (WUL). A person may only use water without a licence if such water use is permissible under Schedule 1 (generally domestic type use) if that water use constitutes a continuation of an existing lawful water use (water uses being undertaken prior to the commencement of the NWA, generally in terms of the Water Act of 1956), or if that water use is permissible in terms of a general authorisation issued under section 39 (general authorisations allow for the use of certain section 21 uses provided that the criteria and thresholds described in the general authorisation is met). The Minister published Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals in GN R.267 of 2017. The Regulations serve to prescribe the procedure and requirements of Water Use Licence Applications (WULAs) as contemplated in Sections 41 of NWA, as well as an appeal against a decision made by a Responsible Authority in terms of Section 41(6) of the NWA. The Regulations provide the requirements for the WULA and state that consideration and decision for a WUL must be undertaken within a period of 300 days of submitting such application. A procedure for public participation must also be conducted as contemplated in section 41(4) of the NWA, as part of the WULA process.		
National Environmental Management: Biodiversity Act, 2004 (Act No. 39 of 2004) (NEMBA). • Threatened or Protected Species Regulations, 2007 (GN R 152 of 2007)[22]. • Alien and Invasive Species Regulations (GN R1020 of 2020)[23]. • Alien and Invasive Species Lists, 2020 (GN 1003 of 2020)[24].	The Act aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. The Act allows for the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith. In terms of section 57 of the Act, no person may carry out any restricted activity involving any species which has been identified by the Minister as "critically endangered species", "endangered species", "vulnerable species" or "protected species" without a permit. The Act defines "restricted activity" in relation to such identified species so as to include, but not limited to, "hunting, catching, capturing, killing, gathering, collecting, plucking, picking parts of, cutting, chopping off, uprooting, damaging, destroying, having in possession, exercising physical control over, moving or translocating". The Minister has made regulations in terms of section 97 of the NEMBA with regards to Threatened and Protected Species which came into effect on 1 June 2007. Furthermore, the Minister published lists of critically endangered, endangered, vulnerable, and protected species in terms of section 56(1) of the NEMBA.	Section 12.8. Section 12.9. Part B.	The management and control of alien invasive plants will be governed by the NEMBA during all the phases of the project.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA). • Listed Activities and Associated Minimum Emission Standards Identified in terms of	The Act aims to regulate and protect the environment, by "providing reasonable measures for the prevention of air pollution and ecological degradation, and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national Norms and Standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto".	4.1 4.1. Part B.	Sibanye Gold is currently in possession of an AEL, reference number LDM/AEL/LCR/004. All project activities will be required to comply with the conditions and requirements stipulated in this AEL.

16 GN R 267 in GG 40713 of 24 March 2017.
17 GN R 139 in GG 35062 of 24 February 2012.
18 GN 1198 in GG 32805 of 18 December 2009.
19 GN 509 in GG 40229 of 26 August 2016.
20 GN 538 in GG 40243 of 2 September 2016.
21 GN 665 in GG 36820 of 6 September 2013.
22 GN R152 in GG 29657 on 23 February 2007.
23 GN R1020 in GG 43735 of 25 September 2020.
24 GN 1003 in GG 43726 of 18 September 2020. Notice replaced the previous Alien and Invasive Species Lists (GN 864 in GG 40166 of 29 July 2016).

Applicable Legislation and Guidelines used to compile the Report	Description	Reference where applied in Report	Applicability
Section 21 of the NEMAQA (GN R 893 of 2013, as amended)[25]. • National Dust Control Regulations, 2013 (GN R 827 of 2013)[26]. • National Atmospheric Emission Reporting Regulations, 2015 (GN R 283 of 2015)[27]. • Atmospheric Dispersion Modelling Regulations, 2014 (GN R 533 of 2014)28. • National Greenhouse Gas Emission Reporting Regulations (GN R 275 of 2017 as amended)29.	The Minister published Listed Activities and Associated Minimum Emission Standards Identified in terms of Section 21 of the NEMAQA in 2013. Part 3 of the Notice makes provision for a list of activities in the following categories which the Applicant must review to determine whether an application for an Atmospheric Emissions Licence (AEL) is required: • Category 1: Combustion Installations; • Category 2: Petroleum Industry, the production of gaseous and liquid fuels as well as petrochemicals from crude oil, coal, gas or biomass; • Category 3: Carbonisation and Coal Gasification; • Category 4: Metallurgical Industry; • Category 6: Organic Chemicals Industry; • Category 7: Inorganic Chemicals Industry; • Category 8: Thermal Treatment of Hazardous and General Waste; • Category 9: Pulp and Paper Manufacturing Activities, including By-Products Recovery; and • Category 10: Animal Matter Processing.		
Section 25 of the Environment Conservation Act, 1989 (Act No. 73 of 1989) (ECA). • Noise Control Regulations (GN R154 of 1992)[30].	These Regulations set out rules relative to the control of noise as provided for in Section 25 of the ECA. The Regulations, among other things: define powers of local authorities to control noise; define general prohibitions in relation with activities that produce noise; define and prohibit noise nuisance; and concern the use of noise measuring instruments.	Part B.	Sibanye Gold is required to comply with all applicable noise-related provisions under these Regulations.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).	The NHRA established the South African Heritage Resources Agency (SAHRA) as well as provincial heritage resources agencies. In terms of the NHRA, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide, or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. Section 38 of the NHRA states that any person who intends to undertake developments categorised in section 38 of the NHRA must at the very earliest stages of initiating such development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. By way of example, the developments referred to in section 38 of the NHRA include: • The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 metres in length; • The construction of a bridge or similar structure exceeding 50 metres in length; • Any development or other activity which will change the character of a site: o Exceeding 5000 m^2 in extent; or o Involving three or more existing erven of subdivisions thereof; or o Involving three or more erven or divisions thereof which have been consolidated within the past five years; or o The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority; or o The rezoning of a site exceeding 10 000 m^2 in extent; or • Any other category of development provided for in the regulations by SAHRA or the provincial heritage resources authority.	Section 12.10. Part B.	A heritage assessment was undertaken by PGS in (2017) (Appendix F). In addition, the project will implement a formal Chance Find Procedure to ensure that any previously unidentified heritage resources encountered during construction or operation are managed in line with regulatory requirements. The project will develop and implement a Chance Find Procedure.
Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA). • Mine Health and Safety Regulations (GN R93 of 1997, as amended)[31]. • Mines and Works Regulations (GN R992 of 1970, as amended)[32].	The Act aims to provide for protection of the health and safety of employees and other persons at mines.	Part B.	Sibanye Gold will have to ensure that employees, contractors, subcontractors and visiting personnel, adhere to the requirements of this Act and its Regulations.

[25] GN R893 in GG 37054 of 22 November 2013, as amended by GN 551 in GG 38863 of 12 June 2015; GN 1207 in GG 42013 of 31 October 2018; GG 687 in GG 42472 of 22 May 2019; GN 421 in GG 43174 of 27 March 2020.
[26] R827 in GG 36974 of 1 November 2013.
[27] GN R283 in GG 38633 of 2 April 2015.
[28] GN R533 in GG 37804 of 11 July 2014.
[29] GN R275 in GG 40762 of 3 April 2017 as amended by GN R994 in GG 43712 of 11 September 2020.
[30] GN R154 of January 1992.
[31] GN R93 in GG 17725 of 15 January 1997.
[32] GN R992 in GG 2741 of 26 June 1970, was published under the Mines and Works Act, but remain in force in terms of Schedule 4 of the MHSA.

Applicable Legislation and Guidelines used to compile the Report	Description	Reference where applied in Report	Applicability
Hazardous Substances Act, 1973 (Act No. 15 of 1973) (HAS).	The Act aims to provide for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products; to provide for the division of such substances or products into groups in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products; and to provide for matters connected therewith.	Part B.	Sibanye Gold will have to ensure that employees, contractors and subcontractors adhere to the requirements of this Act.
Policies and Plans			
National Development Plan (NDP) 2030	South Africa's NDP 2030 outlines the country's long term goals to eliminate poverty and reduce inequality by 2030. It emphasises inclusive economic growth, sustainable environmental practices, and the responsible use of natural resources.	-	The Beisa Project/Operation aligns with the NDP through its potential to create employment opportunities and its commitment to infrastructure development.
Free State Provincial Growth and Development Strategy (PGDS).	The PGDS provides strategic direction for development in the Free State Province and prioritises sustainable development, job creation, and responsible resource utilisation.		The administrative amendment supports regulatory certainty and continuity of existing operations, thereby aligning with the PGDS objective of promoting responsible mining in the province.
National Waste Management Strategy (NWMS, 2020).	The NWMS supports waste minimisation, reuse, and environmentally responsible disposal, aligned with NEMWA.		The Beisa Project/Operation remains consistent with this policy through the maintenance of existing waste management controls.
National Biodiversity Strategy and Action Plan (NBSAP).	The NBSAP aims to conserve biodiversity and ensure the sustainable use of biological resources.		The Beisa Project/Operation aligns with this plan by maintaining existing environmental management and biodiversity protection measures.
Tools, Standards and Guidelines			
Department of Forestry, Fisheries and the Environment (DFFE) Environmental Screening Tool.	The DFFE requires that their National Environmental Screening Tool be utilised prior to undertaking an application for any EA and that the report generated by the tool be submitted with the EA Application. The tool is a geographically based web-enabled application which allows a proponent intending to submit an application for an EA to pre-screen their proposed site for any environmental sensitivities. Regulation 16(1)(b)(v) of the (as amended) requires a screening report to accompany an application for an EA.	-	The BA process will be undertaken in respect of the authorisation process of the Project and is in compliance with the NEMA requirements read with the EIA Regulations, 2014. An BA application together with the Screening Tool Report was submitted to the DMPR.
Waste management standards: South African National Standard (SANS) 10234:2019, Edition 2: Globally Harmonised System of Classification and Labelling of Chemicals (GHS)[33].	SANS 10234:2008 South Africa has moved a step forward in regard to mandating that Globally Harmonised System (GHS) of Classification and Labelling of Chemicals, be implemented within the country. Standard SANS 10234:2019 (edition-2) was published through the South Africa Bureau of Standards on December 17, 2019. This Standard supersedes Standards: SANS 10265 edition-1 of 1999 and SANS 10234 edition-1.01 of 2008. This Standard is aligned with the 4th revision of the UN GHS Purple book and is cross referenced in the NEMWA and National Health Act, 2003 (Act No. 61 of 2003). The National Committee for Standards for Dangerous Goods, including hazardous chemical substances and dangerous goods, is in charge of preparing this Standard. The Committee has decided to permanently remove the Supplement (List of Classification and Labelling of Chemicals in Accordance with GHS), to the SANS 10234:2008 (edition-1), since the Committee believes that the chemicals on this list are constantly changing. This Standard is also mandated by the South Africa Department of Environment Affairs and Department of Health. This Standard will be considered a minimum requirement to adhere to when the draft Regulation of Hazardous Substances Agents (2018) is published, which is projected for 2020, under the authority of the Department of Labour. The Standard provides guidelines for classifying chemicals based on their physical, health, and environmental hazards, as well as standardised labelling elements such as pictograms, signal words, hazard statements, and precautionary statements.	Part B.	The standard was consulted when compiling the Environmental Management Programme (EMPr).
Hazardous substances management standards:	SANS 10089-1:2008 The SANS 10089-1:2008 specifies requirements for aboveground storage facilities used for storing petroleum products in South Africa. This standard outlines technical specifications and safety	-	The standards were consulted when compiling the EMPr.

[33] Standard SANS 10234:2019 (edition-2), South African Bureau of Standards.

Applicable Legislation and Guidelines used to compile the Report	Description	Reference where applied in Report	Applicability
• SANS 10089-1:2008 - Specifications for aboveground storage facilities for petroleum products[34]. • SANS 310: 2011 - Storage tank facilities for hazardous chemicals: Aboveground storage tank facilities for flammable, combustible and non-flammable chemicals[35].	requirements to ensure the safe and efficient storage of petroleum products, including gasoline, diesel, and other fuels. The SANS 10089-1 covers various aspects of aboveground storage facilities, including design criteria, construction materials, tank installation, maintenance procedures, and safety measures. SANS 310:2011 The SANS 310:2011 sets out specifications for aboveground storage tank facilities intended for hazardous chemicals, including flammable, combustible, and non-flammable substances, in South Africa. This standard establishes requirements for the design, construction, operation, and maintenance of storage tank facilities to ensure the safe handling and storage of hazardous chemicals. It covers various aspects such as tank design, material selection, installation procedures, containment systems, ventilation, fire protection, and emergency response measures.		
Air quality: • National Ambient Air Quality Standards (NAAQS), 2009[36]. • GN 486 dated 29 June 2012: National Ambient Air Quality Standard for Particulate Matter with Aerodynamic Diameter less than 2.5 Micron Metres ($PM_{2.5}$)[37].	NAAQS The NAAQS provide comprehensive guidelines and Regulations to safeguard air quality across South Africa. These standards outline permissible concentrations of various air pollutants, including particulate matter, sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, and lead, aimed at protecting public health and the environment. The NAAQS serves as a benchmark for assessing and monitoring air quality levels nationwide, guiding government agencies, industries, and other stakeholders in implementing measures to mitigate air pollution and minimise its adverse impacts. NAAQS – $PM_{2.5}$ The National Ambient Air Quality Standard for Particulate Matter with Aerodynamic Diameter less than 2.5 Micron Metres ($PM_{2.5}$) establishes regulatory guidelines to control and monitor fine particulate pollution in the ambient air across South Africa. $PM_{2.5}$ refers to tiny particles suspended in the air, which can penetrate deep into the lungs and pose significant health risks, including respiratory and cardiovascular problems. The standard sets permissible concentration limits for $PM_{2.5}$ in ambient air, serving as a crucial tool for protecting public health and the environment.	Part B.	The standards were consulted when compiling the EMPr.
Noise standards: • SANS 10103:2008 The measurement and rating of environmental noise with respect to annoyance and to speech communication[38].	SANS 10103:2008 outlines guidelines for the measurement and assessment of environmental noise concerning its potential to cause annoyance and disrupt speech communication. This standard provides a framework for objectively evaluating noise levels in various environments to ensure they meet acceptable thresholds for human comfort and communication.	Part B.	The standard was consulted when compiling the EMPr.
IEM guidelines: • Integrated Environmental Management Information Series – Impact Significance. Information Series 5, 2004[39]. • Integrated Environmental Management Information Series – Cumulative Effects Assessment. Information Series 7, 2004[40]. • Integrated Environmental Management Information Series – Criteria for Determining Alternatives in EIA. Information Series 11, 2004[41]. • Review in EIA, Integrated Environmental Management, Information Series 13, 2004[42]. • Public Participation guideline in terms of NEMA EIA Regulations, 2017[43].	The IEM guidelines serve as a comprehensive framework for managing environmental considerations across various sectors and activities. These guidelines emphasise the integration of environmental considerations into decision-making processes at all stages of planning, implementation, and monitoring. By adopting an integrated approach, IEM seeks to balance socio-economic development with environmental protection, ensuring that development activities are sustainable and minimise adverse environmental impacts. Key components of IEM include stakeholder engagement, EIA, environmental management plans, monitoring, and adaptive management strategies.	This report.	The BA process has been undertaken in accordance with the principles of IEM.

[34] South African Bureau of Standards - SANS 10089-1: The petroleum industry Part 1: Storage and distribution of petroleum products in above-ground bulk installations, 2008.
[35] South African Bureau of Standards - SANS 310: 1ED 2011: Storage Tank Facilities for Hazardous Chemicals - Aboveground Storage Tank Facilities for Flammable, Combustible And Non-Flammable Chemicals, 2011.
[36] GN 1210 in GG 32816 of 24 December 2009.
[37] GN 486 in GG 35463 of 29 June 2012.
[38] South African Bureau of Standards - SANS 10103:2008 The measurement and rating of environmental noise with respect to annoyance and to speech communication, 2008.
[39] DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
[40] DEAT (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
[41] DEAT (2004) Criteria for determining Alternatives in EIA, Integrated Environmental Management, Information Series 11, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
[42] DEAT (2004) Review in Environmental Impact Assessment, Integrated Environmental Management, Information Series 13, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
[43] Department of Environmental Affairs (2017), Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa.

Applicable Legislation and Guidelines used to compile the Report	Description	Reference where applied in Report	Applicability
• Guidelines on Need and Desirability, 2017[44]. • Guideline on the Administration of Appeals, 2015[45].			

[44] DEA (2017), Guideline on Need and Desirability, Department of Environmental Affairs (DEA), Pretoria, South Africa.
[45] Department of Environmental Affairs (2015), Guidelines on the Administration of Appeals, Department of Environmental Affairs, Pretoria, South Africa.

7 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

The proposed activity is the amendment of the MR application for Beatrix 4 Shaft.

7.1 Economic Consideration

The recent transaction between Sibanye Gold and Neo Energy underscores the economic need and desirability of amending the MR application for Beatrix 4 Shaft, which is currently under care and maintenance. This shaft, previously placed on care and maintenance due to declining gold reserves and unfavourable uranium prices, will be acquired by Neo Energy.

Neo Energy will actively progress the project, with plans to secure the full operational footprint and initiate the next phase of development, including the submission of the required environmental application. The reopening and operation of Beatrix 4 Shaft is expected to boost the local economy through increased mineral production, particularly uranium and gold, both of which are in growing demand globally.

Restarting operations will generate direct employment in the mining sector and indirect jobs across downstream industries. These economic benefits will support regional development objectives and contribute to gross domestic product (GDP) growth in a historically mining-dependent area.

This economic argument aligns with the goals set out in the National Development Plan (NDP) 2030, which aims to raise economic growth, promote exports, and make the economy more labour-absorbing.

7.2 Social Consideration

The transaction between Sibanye Gold and Neo Energy also supports the social need and desirability of amending the MR application for Beatrix 4 Shaft. In alignment with the objectives of Sibanye Gold's approved Social and Labour Plan (SLP), the possible recommencement of mining operations could contribute to local socio-economic development through the creation of employment opportunities and skills development.

Should future mining operations resume at Beatrix 4 Shaft, there is potential for direct and indirect job creation, which could benefit local communities that have historically depended on mining as a major source of income. By drawing on the framework of the existing SLP, the project may help address socio-economic challenges in the surrounding area, including high unemployment and limited alternative economic prospects.

In this way, the project could contribute to regional economic upliftment while potentially enhancing social wellbeing through job creation, skills transfer and longer-term community development initiatives aligned with the principles of the current SLP and any future obligations.

7.3 Environmental Consideration

From a regulatory perspective, the amendment of the MR application provides legal and administrative certainty for both the state and the new operator, Neo Energy. It ensures compliance with the MPRDA, which states that the mineral and petroleum resources of South Africa are the common heritage of all its people and vests the State with custodianship of these resources. The Act intends to “make provision for equitable access to and sustainable development of the nation’s mineral … resources”.

By advancing through the correct amendment process, the project aligns with the regulatory framework and promotes transparency, accountability and enforceability of existing social, labour and environmental obligations.

8 MOTIVATION FOR THE OVERALL PREFERRED SITE, ACTIVITIES AND TECHNOLOGY

8.1 Consideration of Alternatives

In terms of the EIA Regulations, 2014, applicants are required to provide sufficient information on feasible and reasonable alternatives to enable informed decision-making. In this case, however, the consideration of alternatives is limited by the nature of the resource and the existing authorisations.

8.1.1 Site Alternatives

The geographic location of the ore resource is fixed within the Witwatersrand Basin, specifically in the Free State Goldfields. As such, the mineral body cannot be relocated, and no alternative sites are possible. Mining can therefore only take place within the defined MR area already under authorisation.

8.1.2 Activity Alternatives

The only viable activity associated with the MR is underground mining, which has been authorised and proven to be technically feasible and economically significant. The orebody contains uranium and gold, both of which are of strategic importance to South Africa’s economy and energy transition objectives. Alternative land uses are not relevant, as the rights to the resource have already been granted under the MPRDA and the deposit’s development potential has been confirmed through exploration and feasibility studies.

8.1.3 Technology Alternatives

Mining methods and supporting infrastructure have been authorised in the approved EMPr and are suited to the depth, geometry, and characteristics of the orebody. Narrow tabular reef extraction methods, supported by shaft-based pumping, ventilation, and hoisting infrastructure, remain the most appropriate and responsible means of extraction. Alternative technologies are not feasible given the orebody configuration and operational history.

8.1.4 Conclusion

The current application is administrative in nature and seeks only to amend the existing MR. No new mining methods, processes, or infrastructure are proposed. Accordingly, no meaningful alternatives exist or can reasonably be considered. The preferred option—continuing mining within the authorised MR using existing technology—remains the only feasible and desirable approach.

8.2 "No-Go" Alternative

The "No-Go" alternative assumes that the proposed amendment of the MR for Beatrix 4 Shaft does not proceed. Under this scenario, the shaft would remain under care and maintenance, and no further development or recommissioning activities would take place.

From an environmental perspective, the "No-Go" option would avoid any incremental impacts associated with re-establishing operations. All current environmental risks would continue to be managed under the existing EMPr and authorisations. No new surface disturbance or infrastructure would be introduced.

However, the "No-Go" option carries significant socio-economic disadvantages. Without recommissioning, the mineral resource would remain unutilised, leading to a loss of potential contributions to national revenue, foreign exchange earnings, and local economic growth. Critically, local communities would not benefit from the anticipated employment opportunities, skills development, and social upliftment initiatives linked to the reopening of the shaft. High unemployment and limited economic alternatives in the region would therefore remain unaddressed.

On balance, while the "No-Go" alternative would prevent any new environmental risk, it would also perpetuate economic stagnation and social vulnerability in a region historically reliant on mining. For this reason, the "No-Go" option is not considered desirable when weighed against the strategic, economic, and social benefits of the proposed amendment.

9 FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED ALTERNATIVES WITHIN THE SITE

9.1 Identification of the Resource

The location of the ore body is geologically fixed within the Free State Goldfields of the Witwatersrand Basin. Geological investigations, including historical exploration drilling, channel sampling, and feasibility studies, confirmed the presence of viable uranium and gold reserves in the Beisa and Kalkoenkrans reefs. As the mineral deposit is immovable, no alternative site could be considered.

9.2 Review of Existing Authorisations and Infrastructure

The proposed amendment builds on the framework of existing authorisations, including the approved MR and EMPr. Beatrix 4 Shaft has existing shaft infrastructure, underground development and surface facilities. The continuation of mining within this footprint ensures that no new land disturbance or large-scale infrastructure development is required, reducing the environmental and regulatory risks associated with greenfield development.

9.3 Consideration of Activity and Technology Alternatives

Alternative land uses were considered irrelevant, as the resource has already been declared of strategic and economic significance. Mining remains the only viable activity within the site.

Similarly, the mining methods and technologies currently authorised were reviewed and found to be the most appropriate given the tabular nature, depth, and geotechnical conditions of the ore body. No alternative extraction methods would provide comparable safety, efficiency, or environmental control.

9.4 Socio-Economic and Policy Alignment

The decision-making process also took into account socio-economic needs, including job creation, skills development, and regional economic upliftment, in alignment with national and provincial policies such as the NDP (National Planning Commission, 2012) and the Free State Provincial Growth and Development Strategy (Free State Provincial Government, 2013). The preferred alternative supports responsible utilisation of mineral resources while contributing to sustainable development objectives.

9.5 Environmental Safeguards

Environmental considerations formed part of the evaluation process. The continuation of operations under the existing EMPr ensures that environmental risks continue to be effectively managed. The administrative nature of the amendment means no new impacts are anticipated beyond those already authorised.

9.6 Preferred Alternative

Based on these considerations, the preferred alternative is to proceed with the administrative amendment of the MR to allow the recommissioning of Beatrix 4 Shaft. This option makes optimal use of existing infrastructure, ensures compliance with legislative requirements, minimises environmental risk, and maximises socio-economic benefits.

10 DETAILS OF THE DEVELOPMENT FOOTPRINT ALTERNATIVES CONSIDERED

10.1 Resource and Site Constraints

The mineral resource is geographically fixed within the Witwatersrand Basin and cannot be relocated. Mining operations are therefore confined to the Beatrix 4 Shaft area, which has already been developed with shaft sinking, underground workings, pumping systems, and supporting surface infrastructure. As such, no alternative sites are possible within the MR area.

10.2 Existing Infrastructure Footprint

The existing surface and underground infrastructure were designed and authorised for the safe and efficient extraction of the ore. Re-using these established facilities significantly reduces the need for new disturbance and minimises environmental impacts. Expansion beyond the current footprint would offer no additional benefit and would increase costs, land disturbance, and permitting requirements.

10.3 Alternative Layouts or Configurations

Alternative layouts for surface infrastructure were considered during the original project design phase. However, the existing infrastructure remains adequate to support recommissioning without modification. Given that this application is administrative in nature, no new or expanded layouts are proposed.

10.4 “No-Go” Alternative

The “No-Go” alternative, whereby the project does not proceed, would result in no additional land disturbance beyond the current footprint. While this option avoids incremental environmental impacts, it would also result in lost socio-economic opportunities associated with mineral extraction, employment, and regional development (as outlined in Section 7.3).

10.5 Conclusion

The preferred alternative is to utilise the existing Beatrix 4 Shaft infrastructure within the authorised MR footprint. This approach ensures compliance with regulatory requirements, minimises environmental disturbance, and maximises the use of previously disturbed areas while unlocking significant socio-economic benefits. No additional development footprint alternatives are considered feasible or reasonable under this amendment application.

11 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

11.1 Approach and Methodology

The public participation approach adopted for this project is in line with the processes contemplated in Chapter 6 (regulation 39 to 44) of the EIA Regulations, 2014. A phased approach for the public participation activities has been adopted as aligned with requirements of NEMA, namely:

- Application Phase.
- Announcement Phase.
- BA Phase.
- Decision Phase.

Table 11-1 notes the public consultation phases, objectives for each interaction with I&APs, key activities undertaken and outputs.

Table 11-1: Public Consultation Phases, Objectives, Key Activities and Outputs

Phase	Objective	Key Activities	Key Outputs
Application Phase	To initiate the process by identifying triggered Listed Activities and submitting the required application.	Conduct site screening to confirm applicable Listed Activities. Prepare and submit the Environmental Authorisation (EA) Application to Department of Mineral and Petroleum Resources (DMPR).	Submission and formal acceptance of the EA Application by the DMPR.
Announcement Phase	To inform stakeholders of the proposed project and initiate the public participation process.	Publish advertisements in national and local newspapers. Erect site notices. Distribute a Background Information Document (BID).	Public awareness of the project. Receipt of initial comments and concerns from Interested and Affected Parties (I&APs).

Phase	Objective	Key Activities	Key Outputs
Basic Assessment Phase	To assess the potential environmental impacts of the project and propose mitigation measures.	Conduct specialist studies and compile the Draft Basic Assessment Report (BAR). Circulate the Draft BAR for 30-day public review. Submit Final BAR.	Submission of a comprehensive BAR outlining potential impacts and proposed mitigation measures.
Decision-Making Phase	To enable the Competent Authority to evaluate the Final BAR and issue a decision.	DMPR reviews the Final BAR Conditions of authorisation may be included to ensure compliance.	EA granted.

11.2 Public Participation Activities

The public participation process (PPP) was executed in compliance with the regulations stipulated in the EIA Regulations, 2014. An integrated approach, conducting a combined PPP for both applications, was adopted to ensure effective engagement with stakeholders. The Public Participation Report is attached as Appendix H.

11.3 Announcement to Local Municipalities

An invitation letter (Appendix A of the Public Participation Report) was sent on 2 June 2025 to the Offices of the Speaker of the Masilonyana and the Matjhabeng local municipalities respectively. The letter announced the intention of the applications, invited the participation of the municipalities and requested them to assist with hosting public meetings in their areas of jurisdiction. Matjhabeng Local Municipality provided their cooperation and assisted with the identification of a suitable public venue. Masilonyana Local Municipality requested to first have a clarification meeting. Subsequently, a virtual meeting was held on 19 June 2025 between representative of the Masilonyana Local Municipality, Sibanye-Stillwater and GCS during which the applications were announced, and assistance was requested with the rolling-out of the PPP.

At the request of the Masilonyana Local Municipality, GCS and Sibanye-Stillwater attended a meeting on 15 July 2025 where GCS presented the public participation approach to a larger audience of Masilonyana Local Municipality representatives. A memorandum of the points discussed was made available to all who attended the meeting (Appendix A of the Public Participation Report). As one of the outcomes of the meeting, the Masilonyana Local Municipality confirmed its willingness to assist in developing a public participation strategy in line with Regulation 41 of the EIA Regulations, 2014.

For the remainder of July 2025 GCS attempted to convene an online workshop with the Masilonyana Local Municipality to jointly develop the public participation strategy. Despite several follow-up attempts, no response was received. A draft Stakeholder Engagement Plan (SEP) (Appendix A of the Public Participation Report) was submitted to the Masilonyana Local Municipality on 31 July 2025 requesting comments by 6 August 2025 to enable timely implementation of the plan. No response was received despite follow-up efforts.

Sibanye-Stillwater submitted a formal letter to the Masilonyana Local Municipality on 8 August 2025 emphasising the importance of finalising the SEP and highlighting the regulatory implications of continued delays. No response was received.

Sibanye-Stillwater submitted a formal letter to the Regional Manager of the DMPR outlining the challenges faced and requesting guidance in terms of the process followed with the Masilonyana Local Municipality. Following engagements with the DMPR, a public meeting was not held in the Masilonyana municipal area and extension was received for the submission of the Final Basic Assessment Reports (FBARs) until 16 January 2026.

11.4 Development of Stakeholder Database

An existing stakeholder database, obtained from Sibanye Gold, was reviewed and updated. The updated database included I&APs grouped into the following categories:

- Authorities: National and Provincial;
- District and Local Municipalities: Lejweleputswa District Municipality, Matjhabeng and Masilonyana Local Municipalities;
- Environmental Non-Profit Organisations: Including the Federation for Sustainable Environment;
- Adjacent Landowners and those residing in the Mining Rights areas;

The stakeholder database is included as Appendix A of the Public Participation Report.

11.5 Public Participation Media

In compliance with NEMA, the following public participation media were employed during the assessment:

11.5.1 Publication of Newspaper Advertisements

Newspaper advertisements in English and Sesotho were published as follows:

Newspaper	Date
Masilonyana News	15 November 2025
Free State Sun	31 October 2025
Sowetan	30 October 2025
Vista	30 October 2025

The listed newspapers are all distributed in the Mining Rights and surrounding areas. The advertisement notified I&APs of the project, invited them to register and provide comments on the Draft Basic Reports (DBARs). Refer to Appendix B of the Public Participation Report for proof of the placement of the advertisements.

11.5.2 Site Notices

Site notices in English and Sesotho were placed on 13 November 2025 in public locations around the project area to inform I&APs about the project and encourage their registration and participation. A table and map indicating the location of site notices are provided in Appendix D of the Public

Participation Report.

11.5.3 Background Information Document and Registration and Comment Form

The BID, which was available in English and Sesotho provided details on the applications, availability of the DBARs, environmental regulatory processes, opportunities for participation and was distributed on 13 November 2025 via email to registered I&APs. A Registration and Comment Form accompanied the BID to facilitate stakeholder registration and feedback. Refer to Appendix E of the Public Participation Report.

11.5.4 Announcement of the availability of the Draft Basic Assessment Reports

On 11 November 2025, stakeholders were notified of the availability of the DBARs via email and SMS. The DBARs were accessible electronically on two separate websites and in hard copy at the locations listed below.

Place	Address
Hard copies:	
Meloding Public Library	Meloding Street, Virginia
Virginia Public Library	Virginia Garden Circle
Welkom City Library	Welkom Central, Welkom
Theunissen Public Library	Le Roux Street, Pienaar Ave, &, Theunissen
Electronic copies:	
GCS Website	https://www.gcs-sa.biz/public-documents/
Sibanye's Data Free Portal	https://ulwazi.datafree.co/#/pub/login

Proof of delivery is provided in Appendix F of the Public Participation Report.

A legislated 30-day review period was provided for stakeholders to review and comment on the DBARs, spanning 14 November 2025 to 8 January 2026. Notification emails are included in Appendix F of the Public Participation Report, and SMS notifications which were sent on 12 November 2025 are included as Appendix G of the Public Participation Report.

11.5.4.1 Public meeting to review the contents of the Draft Reports

A public meeting was held on 26 November at 14:00 at the Ferdie Meyer Hall in Welkom. The purpose of the meeting was to review and discuss the content of the Draft Basic Assessment Reports. Notice of the meeting was provided in email notifications, in the advertisements published, site notices placed. The meeting was attended by members of the community who reside in the Mining Rights area. Appendix H of the Public Participation Report provides the attendance register and presentation delivered during the meeting. The discussions which took place during the meeting are included in the CRR.

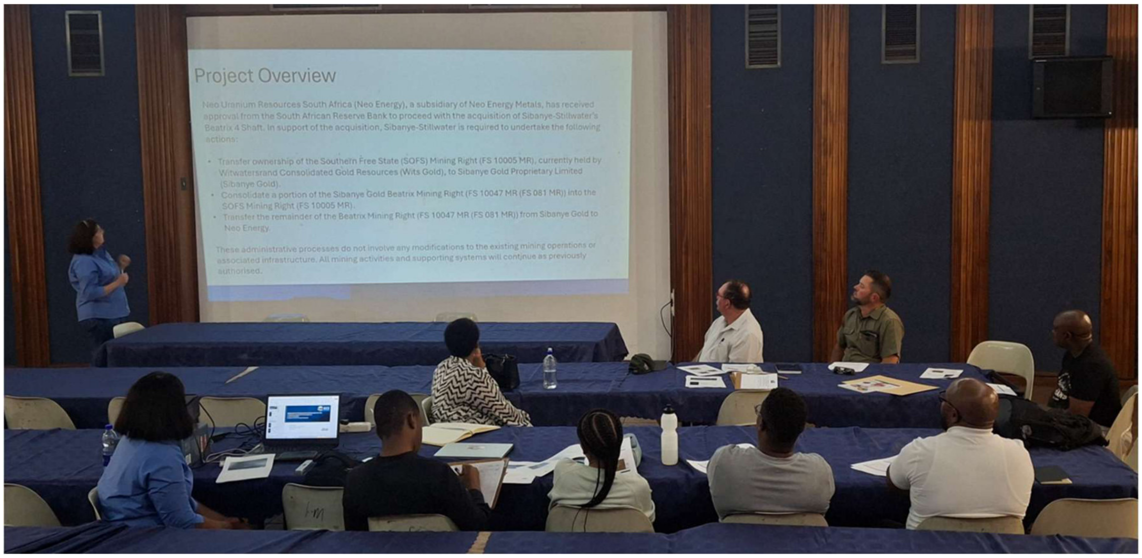


Figure 11-1: A public meeting was held on 26 November 2025 at the Ferdie Meyer Hall in Welkom

11.5.5 Announcement of the availability of the Final Basic Assessment Reports

The CRR was appended to the FBARs for submission to the DMPR. The FBARs were released electronically on the GCS and Sibanye websites for stakeholders to verify the accuracy of their comments and how these comments have been considered in the submissions. Notifications regarding the FBARs' submission were sent via email and SMS on 19 January 2026.

Notification of the decision to be taken on the application by the DMPR will be distributed to I&APs. They will also be informed of the appeals procedure.

11.6 Comments and Response Report

All comments received from the announcement in November 2025 and from the public review of the DBARs were captured in a CRR (Appendix I of the Public Participation Report). The CRR is appended to the FBARs as a full record of issues raised to date, including responses on how the issues were considered.

11.7 Conclusion

A comprehensive PPP was conducted for the project, ensuring extensive efforts to inform and engage I&APs. The stakeholder database was regularly updated to maintain effective communication, and notifications and reports were disseminated through multiple channels.

The process adhered to legal requirements and principles of transparency, providing all relevant stakeholders with an opportunity to contribute and be heard.

The DMPR will assess the FBARs and make an informed decision on whether the project should be approved. The decision will be communicated to I&APs as per the regulatory requirements.

12 THE ENVIRONMENTAL ATTRIBUTES

12.1 Climate

The information in this section has been sourced from the Integrated Water and Waste Management Plan (IWWMP) compiled by Shangoni Management Services (Pty) Ltd for the 2022 annual period (Shangoni, 2022), as well as the EMPr for Beatrix Mine (Beatrix Mine, 2004).

Beatrix Mine is situated in a semi-arid summer rainfall region, where the mean annual precipitation (MAP) ranges between 400 millimetres (mm) and 600 mm. Regular thunderstorms and showers occur during the summer months as a result of diurnal convective heating, with an average of 40–60 thunderstorms per year. Frost is common during the cold winter months.

The prevailing wind direction in the area is from the north-east, and average wind speeds generally do not exceed 6 metres per second. Seasonal temperature variations are pronounced, with mean maximum temperatures averaging approximately 32°C in January and 20°C in June. The mean monthly maximum and minimum temperatures associated with Beatrix Mine, as reported by the Water Research Commission (1992), are presented in Table 12-1.

Table 12-1: Mean monthly temperatures for Beatrix Mine (Water Research Comission , 1992)

Date	Mean maximum temperature (°C)	Mean minimum temperature (°C)
January	32.1	18.0
February	31.4	15.5
March	29.8	14.4
April	27.1	12.0
May	25.0	6.8
June	20.1	3.8
July	20.5	3.2
August	23.4	5.9
September	26.9	9.3
October	28.5	11.8
November	29.9	14.5
December	31.3	16.2

12.1.1 Rainfall and Evaporation

Precipitation during the summer months accounts for approximately 79% of the MAP in the area, with an average of 526 mm per annum (EMPr, 2004). The mean annual evaporation (MAE) for the Matjhabeng District is considerably higher, at approximately 2 015 mm (Water Research Comission , 1992). The monthly distribution of precipitation and evaporation values relevant to Beatrix Mine is summarised Table 12-2.

Table 12-2: Mean monthly precipitation (Beatrix Mine, 2004)and evaporation (Water Research Comission , 1992) for Beatrix Mine

Date	Mean monthly precipitation (mm)	Mean monthly evaporation (mm)
January	99	254
February	67	190
March	67	181
April	49	134
May	23	103
June	8	83
July	7	93

Date	Mean monthly precipitation (mm)	Mean monthly evaporation (mm)
August	5	139
September	17	176
October	49	219
November	63	219
December	72	225
Annual	526	2015

12.2 Topography

The information in this section has been derived from the Beatrix Mine Hydrogeological Study compiled by SRK Consulting (SRK , 2019).

The topography of the Beatrix 4 Shaft area is defined by the gently undulating plains of the Free State highveld. Elevations range from approximately 1 450 metres above mean sea level (mamsl) along the southern ridgelines to about 1 285 mamsl in the Sand River valley, resulting in a modest overall relief of roughly 165 m. Within the shaft complex itself, the terrain is comparatively flat, with an average elevation of around 1 300 mamsl, making it well suited for large-scale surface infrastructure. This flat relief has enabled the establishment of major engineered features, including two TSFs located to the west of the shaft and extensive upper and lower evaporation dams to the south-west.

12.3 Geology

The information in this section has been derived from the Mining Works Programme prepared by Sibanye Gold (Sibanye, 2025).

12.3.1 Regional Geology

Beatrix Mine is located within the Free State Goldfield, situated along the south-western margin of the Witwatersrand Basin. The basin consists of sedimentary rocks of the Witwatersrand Supergroup, deposited between 3 100 and 2 700 million years ago. These sediments are overlain in places by younger volcanic and sedimentary units, including the Ventersdorp and Karoo sequences.

Gold and uranium mineralisation within the basin is hosted in quartz-pebble conglomerates, known as reefs, which were deposited on erosional unconformity surfaces. These reefs represent ancient braided river systems and alluvial fan deposits. In the Free State Goldfield, reef packages dip shallowly (10–25°) and are laterally extensive, with typical thicknesses of 1–2.5 m.

12.3.2 Local Geology at Beatrix 4 Shaft

The local geology is structurally defined by a north–south trending syncline, which controls the dip and geometry of the reefs. At Beatrix 4 Shaft, the reefs dip moderately to the east in the western portions of the lease area, flattening further eastwards into the basin. Intrusive dolerite dykes and sills are common, crosscutting the stratigraphy and occasionally affecting mining operations due to water and methane inflows. Faulting is also present, with north–south normal faults and NW–SE reverse faults causing local displacements of 30–200 m.

12.3.3 Economic Reefs

12.3.3.1 Beatrix Reef

The Beatrix Reef occurs at the base of the Elsburg Formation and is the primary orebody mined at Shafts 1–3. It is an oligomictic, pebble-supported conglomerate, dominated by milky and smoky quartz pebbles with minor black chert in a siliceous–argillaceous matrix. Although not a primary source at Shaft 4, it provides a regional stratigraphic reference.

12.3.3.2 VS5 Reef

The VS5 Reef is a stratigraphic equivalent of the Beatrix Reef, occurring at the same horizon but with a polymictic composition and abundant non-durable pebbles. At Shaft 4, the VS5 forms the hangingwall above the Kalkoenkrans Reef.

12.3.3.3 Aandenk Reef

The Aandenk Reef lies at the base of the Kimberley Formation. It is characterised by medium to very large vein quartz pebbles, typically in a yellowish quartz-arenite matrix. It can occur as a well-packed conglomerate or as a thinner pebble lag facies.

12.3.3.4 Composite Reef

The Composite Reef represents a reworked accumulation of Beatrix and Aandenk material, overlain by VS4 conglomerates. It is generally of low economic value but has yielded localised high-grade zones in the northern parts of Beatrix 3 Shaft.

12.3.3.5 Kalkoenkrans Reef (Primary Shaft 4 Orebody)

The Kalkoenkrans Reef is the main economic orebody at Beatrix 4 Shaft, occurring at the base of the Kimberley Formation. It is a well-packed, medium to large pebble conglomerate, comprising milky and smoky quartz pebbles with minor black chert. The reef varies in thickness, from pebble lags to multiple banded conglomerates interbedded with quartzite. This reef is consistently gold-bearing and has supported the majority of mining at Shaft 4.

12.3.3.6 Beisa Reef (Gold-Uranium)

The Beisa Reef occurs at the base of the Blyvooruitzicht Formation and is notable for containing both gold and uranium. It is a thin tabular conglomerate, typically 3–30 cm thick, with quartz and chert pebbles overlain by siliceous quartzite. Uranium enrichment is commonly associated with carbon seams and fine-grained pyrite. Although deeper than the Kalkoenkrans Reef in most areas, it has been historically mined at Shaft 4 where it occurs closer to surface along the western margin of the basin.

12.3.4 Structural Features

Beatrix 4 Shaft's geology is strongly influenced by structural controls. The reef horizons are warped into broad synclinal and overfolded geometries, with dips ranging from 10° to over 50° depending on location. Faulting is common, with major displacements up to 200 m, and intrusive dykes are widespread, ranging from less than a metre to 50 m thick. These geological complexities affect mine planning and water management but also help define the distribution of payable ore zones.

12.4 Soil, Land Use and Land Capability

The information in this section has been derived from the Biodiversity Baseline Assessment Report and Section D: Wetland Assessment (NSS, 2016b) compiled by Natural Scientific Services (NSS).

12.4.1 Soils

The soils in the Beatrix 4 Shaft area are primarily derived from Karoo Supergroup sandstones, mudstones, and shales, with local dolerite intrusions contributing to their variability. Over these parent materials, a mosaic of aeolian sands, colluvial deposits, and alluvial soils has developed.

- Upland areas within the shaft complex are dominated by sandy loams and sandy clay loams, generally moderately deep to deep and well-drained, but highly erodible when disturbed.
- Drainage lines and valley-bottom wetlands, particularly along the Boschluis Spruit, are characterised by clay-rich alluvial soils. These are seasonally waterlogged and support wetland habitats but are vulnerable to gulley erosion and sediment mobilisation.
- Seepage zones west and south of the shaft have sandy soils with perched water tables, promoting infiltration but sensitive to compaction and agricultural disturbance.
- Depressions and pans contain clay-enriched, sometimes sodic soils with dispersive properties, particularly where used for evaporation ponds. These soils are poorly drained and prone to degradation.

12.4.2 Land Use

The land surrounding Beatrix 4 Shaft is used predominantly for commercial maize cultivation, livestock grazing, and mining infrastructure. Agricultural practices have altered natural soil profiles through ploughing, irrigation, and chemical inputs, reducing natural vegetation cover and increasing erosion risk. Livestock, particularly community-owned cattle and sheep, contribute to soil trampling and compaction in grazing areas.

Within the mining lease area, large tracts of land have been transformed for operational infrastructure, including TSFs, evaporation dams, shaft infrastructure, and haul roads. These activities have resulted in significant disturbance, compaction, and contamination risks for soils. Aerial imagery indicates that remaining natural grassland is fragmented, with much of the landscape converted to cropland or disturbed by mining

12.4.3 Land Capability

According to the Draft Biodiversity and Action Plan Report, the land capability of the region is constrained by its soil and climatic conditions. The Free State highveld soils are generally marginal for arable agriculture due to their erodibility and susceptibility to moisture stress in the semi-arid climate. Productive land uses are limited to grazing, maize production, and controlled game farming.

Mining has further reduced land capability by stripping and stockpiling soils, compacting the land surface, and altering drainage patterns. Areas around TSFs and evaporation ponds have low to very low agricultural potential without significant rehabilitation. Restoration of land capability will require effective soil management strategies, including minimisation of stripping, careful stockpiling, reinstatement of topsoil, erosion and dust control, and active rehabilitation of disturbed areas. The Draft Biodiversity and Action Plan Report recommends ongoing monitoring of dust, erosion, sedimentation, and soil contamination, with corrective action where necessary

12.5 Groundwater

The information in this section has been derived from the Hydrogeological Study for Beatrix Mine, compiled by SRK Consulting (SRK , 2019) attached in Appendix B.

The hydrogeological setting of Beatrix 4 Shaft is complex and influenced by the geology of the Karoo Supergroup and dolerite intrusions. Groundwater is hosted in a combination of perched, fractured, and contact aquifers, with dolerite intrusions acting primarily as aquitards but in places providing weak secondary permeability. This interaction between aquifer systems, surface infrastructure, and natural drainage results in a high degree of vulnerability, particularly where perched and fractured aquifers connect directly to wetlands and the Boschluis Spruit valley-bottom system.

12.5.1 Aquifer Systems

Perched aquifers occur in the shallow weathered zone above clay-rich horizons. They are discontinuous and strongly influenced by seasonal rainfall, with rapid fluctuations in water levels following summer storms. Although limited in storage, they play an important ecological role by sustaining seep wetlands. However, they are also extremely vulnerable to contamination from surface activities such as tailings storage and dirty water management, providing a direct link between surface facilities and valley-bottom wetlands.

The fractured Karoo aquifers represent the most important hydrogeological feature beneath Beatrix 4 Shaft. These aquifers occur within the sandstones, shales, and mudstones of the Beaufort Group and are controlled by bedding planes, joints, and fault structures. Although storage is low, transmissivity can be locally high, creating preferential flow paths that allow for regional plume migration. This system is the primary transport pathway for contaminants moving away from the shaft towards the Boschluis Spruit.

At the interface between dolerite sills or dykes and sedimentary rocks, contact aquifers are developed. Fracturing and thermal alteration along these contacts enhance permeability, creating lateral conduits that can extend the footprint of contaminant plumes beyond the immediate vicinity of the tailings facilities. Dolerite bodies themselves generally act as aquitards, restricting vertical flow. However, where intrusions are faulted or weathered, their protective capacity is reduced, and localised pathways may develop.

12.5.2 Recharge and Groundwater Flow

Recharge in the area is constrained by both climate and geology. The mean annual precipitation of approximately 526 mm translates to an estimated recharge rate of only 6–20 mm per year, equivalent to 0.7–3% of MAP. Recharge is greatest in elevated sandy areas but limited across the shaft complex where compaction and clayey soils reduce infiltration.

Groundwater levels at Beatrix 4 Shaft range between 1 318 and 1 366 metres above mean sea level (mamsl). Water levels are shallowest in drainage valleys and deepest beneath mine infrastructure, where cones of drawdown and mounding effects have developed around TSFs and evaporation dams. Seasonal fluctuations are observed, with perched aquifers responding most rapidly to rainfall.

The regional flow regime is directed north-east towards the Boschluis Spruit, which eventually drains into the Sand River system. Flow is controlled by both the gentle topographic gradient and the structural features of the fractured Karoo aquifers. This establishes a direct hydraulic linkage between the shaft's surface infrastructure and sensitive receptors, most notably the Boschluis Spruit wetlands.

12.5.3 Borehole Network and Monitoring

An extensive borehole monitoring network of more than 50 boreholes is in place across Beatrix 4 Shaft. This includes perimeter boreholes around tailings facilities and dams, downgradient boreholes towards the Boschluis Spruit, and background boreholes in up-gradient areas. In some cases, paired shallow and deep boreholes allow separation of perched aquifer behaviour from deeper Karoo aquifer dynamics.

Routine monitoring includes water level measurements, pH, electrical conductivity (EC), and laboratory analysis of major ions and trace metals. Results show elevated EC values of 1,000–1,300 mS/m near the northern evaporation dams, with associated increases in sulphate and chloride. Downgradient boreholes confirm plume migration towards the Boschluis Spruit, while up-gradient boreholes generally reflect baseline conditions with EC <100 mS/m.

This monitoring network provides the basis for compliance with WUL requirements and serves as an early warning system for contamination. However, SRK (2019) recommends expansion of downgradient coverage, the installation of continuous loggers, and the development of a trigger action response plan (TARP) to ensure timely intervention when water quality objectives are exceeded.

12.5.4 Groundwater Quality and Contaminants

Baseline groundwater quality in the region is typically of a Calcium–Magnesium–Bicarbonate water type with EC values below 300 mS/m. However, monitoring around Beatrix 4 Shaft shows significant impacts from mining activities. Elevated sulphate and chloride concentrations are consistently recorded near TSFs and evaporation dams, with sulphate exceeding 1 000 mg/l in some boreholes. Chloride values above 250 mg/l have also been detected. Trace metals, particularly iron and copper, are sporadically elevated near WRDs, while uranium has been detected at low but notable levels in boreholes closest to TSFs. The significance of these impacts is primarily limited to the mining right footprint.

Surface water monitoring supports these findings. EC values in the Boschluis Spruit increased from 569 mS/m in 2018 to 765 mS/m in 2017 at the same site, exceeding the Target Water Quality Range for aquatic ecosystems. Although the Doring River downstream does not yet show measurable impacts, the Boschluis Spruit wetlands are clearly at risk of degradation.

12.5.5 Source–Pathway–Receptor Assessment

The source–pathway–receptor (SPR) analysis identifies the major sources of contamination at Beatrix 4 Shaft as the TSFs, evaporation dams, WRDs, return water dams, and sewage discharges. The perched aquifers, fractured Karoo aquifers, and contact aquifers represent the pathways by which contaminants are transported. Receptors include the Boschluis Spruit valley-bottom wetlands, the Sand River, and groundwater abstraction points used by local farmers.

Risks are highest in areas surrounding the northern evaporation dams, where seepage enters shallow perched aquifers and migrates into the fractured Karoo system, providing a direct pathway to the Boschluis Spruit (Figure 12-1).

12.5.6 Groundwater Modelling and Predictions

Numerical groundwater flow and contaminant transport modelling was undertaken as part of the Hydrogeological Study (SRK , 2019) to understand current impacts, predict future contaminant plume behaviour, and evaluate post closure conditions. The model was calibrated against long term water level data, seasonal responses to recharge, and historical trends in EC and sulphate concentrations. Calibration accuracy was achieved within ±5% for hydraulic heads and ±10% for water chemistry, providing confidence in the predictive capability of the model.

The modelling confirmed that seepage plumes are already present around the northern evaporation dams and TSFs. Under current conditions (2019), plumes are relatively localised, with elevated sulphate and chloride concentrations extending into adjacent fractured Karoo aquifers. These plumes have not yet reached the Boschluis Spruit, but they are trending in that direction.

For the LoM (2025) scenario, the model predicts continued expansion of sulphate- and chloride-dominated plumes. Plume footprints are projected to migrate up to 500 m downgradient, moving closer to the Boschluis Spruit valley-bottom wetlands. Concentrations are expected to increase, particularly in boreholes directly downgradient of the northern evaporation dams. This indicates that, without intervention, seepage impacts will extend beyond current containment zones during the remaining operational years.

In the post closure (2050) scenario, water table rebound of up to 7 m is projected following the cessation of dewatering and abstraction. This rebound increases the risk of groundwater discharge (decant) into surface receptors, especially in low-lying valley-bottom wetlands along the Boschluis Spruit. Under these conditions, contaminant plumes expand further and are predicted to discharge into surface systems. The model also highlights uranium as a growing concern post closure, as redox changes associated with rebound and oxidising conditions may mobilise uranium previously bound to sediments or tailings material.

Figure 12-2 to Figure 12-4 (plume distribution under current, LoM, and post closure scenarios) and Figure 12-5 and Figure 12-6 (depth to groundwater and rebound projections) provide a clear visual representation of contaminant migration pathways and potential post closure risks.

12.5.7 Conclusions and Recommendations

The hydrogeological assessment concludes that Beatrix 4 Shaft is underlain by aquifer systems of high vulnerability, particularly the perched and fractured Karoo aquifers. Current monitoring confirms the presence of contaminant plumes around mine residue deposits, with sulphate, chloride, and elevated EC values recorded in boreholes adjacent to the northern evaporation dams. Although these plumes are not yet fully impacting the Boschluis Spruit, the model predicts that LoM and post closure conditions will result in significant plume expansion and, in the absence of mitigation, possible decant into sensitive surface water receptors.

The Boschluis Spruit valley-bottom wetlands have been identified as the critical receptor due to their Ecological Importance (EI) and hydraulic connectivity to the aquifer system. The Sand River system further downstream remains less impacted at present but is vulnerable in the long term. The mobilisation of uranium, although currently low in concentration, represents an additional long term risk that must be addressed proactively.

To manage these risks, SRK (2019) recommends a combination of enhanced monitoring, source control, pathway management, and receptor protection. The borehole monitoring network should be expanded to include additional downgradient boreholes closer to the Boschluis Spruit, and key sites should be equipped with continuous loggers to allow real-time tracking of water levels and EC trends. A TARP should be implemented, establishing clear thresholds for intervention when water quality or water levels exceed baseline limits.

Source control measures should focus on reducing seepage at TSFs and evaporation dams, either through improved lining systems or the installation of seepage interception trenches and collection drains. Pathway management may include hydraulic containment or permeable reactive barriers to intercept plumes before they reach sensitive receptors. Receptor protection should be achieved through the establishment of buffer zones along the Boschluis Spruit and through ecological monitoring of wetland condition and function.

Post closure planning must anticipate rebound and decant risks. Active treatment technologies, such as pump and treat systems or sulphate-reducing bioreactors, should be considered for long term management of contaminated water. Financial provision for such treatment must be included in closure planning to ensure sustainable management beyond the operational life of the shaft.

In summary, while current impacts are localised, modelling clearly shows that risks to the Boschluis Spruit and downstream systems will increase over time. Effective monitoring, intervention, and closure planning are therefore essential to reduce long term liabilities and protect water resources.

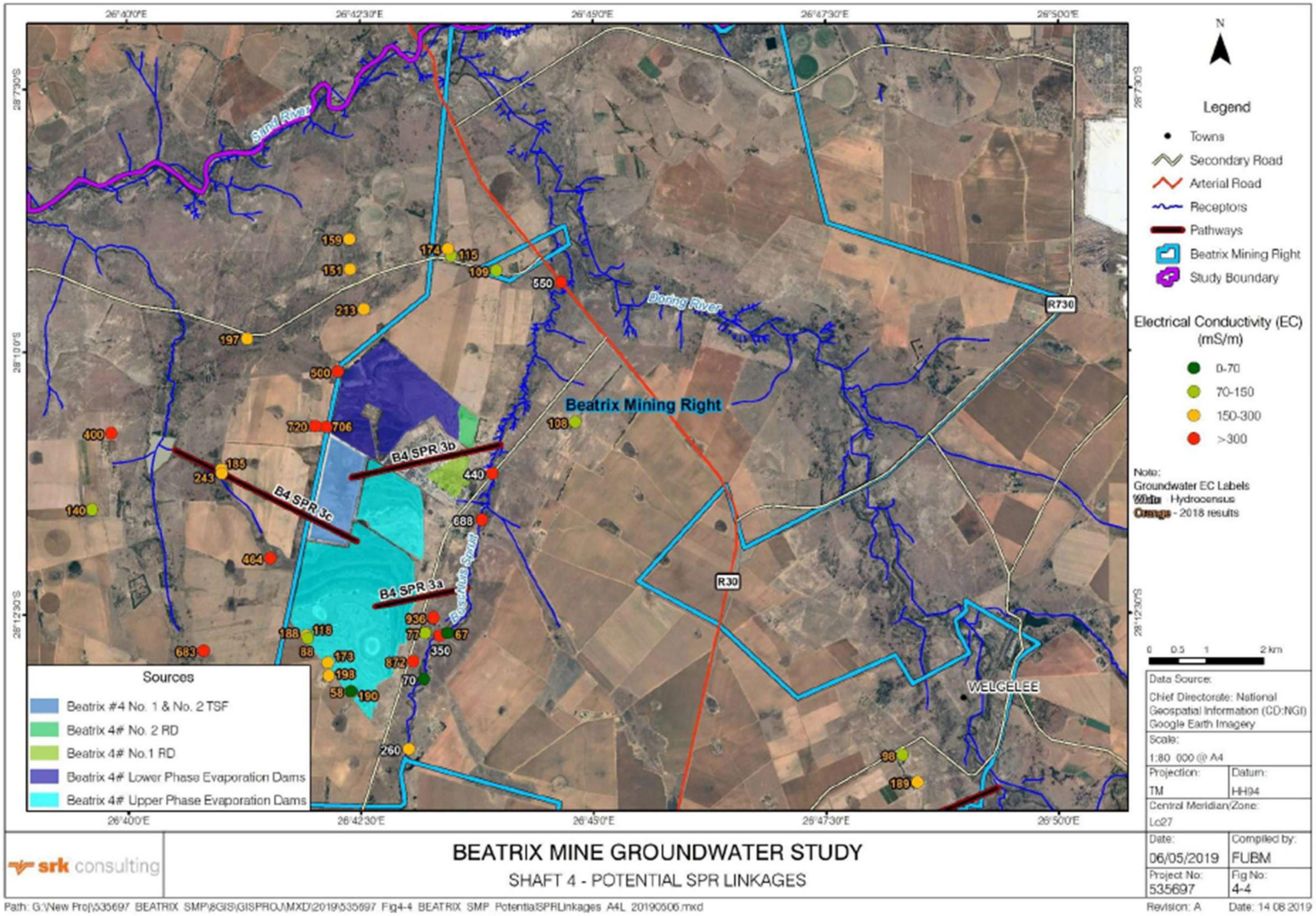


Figure 12-1: Beatrix 4 Shaft - Potential SPR Linkages (SRK , 2019)

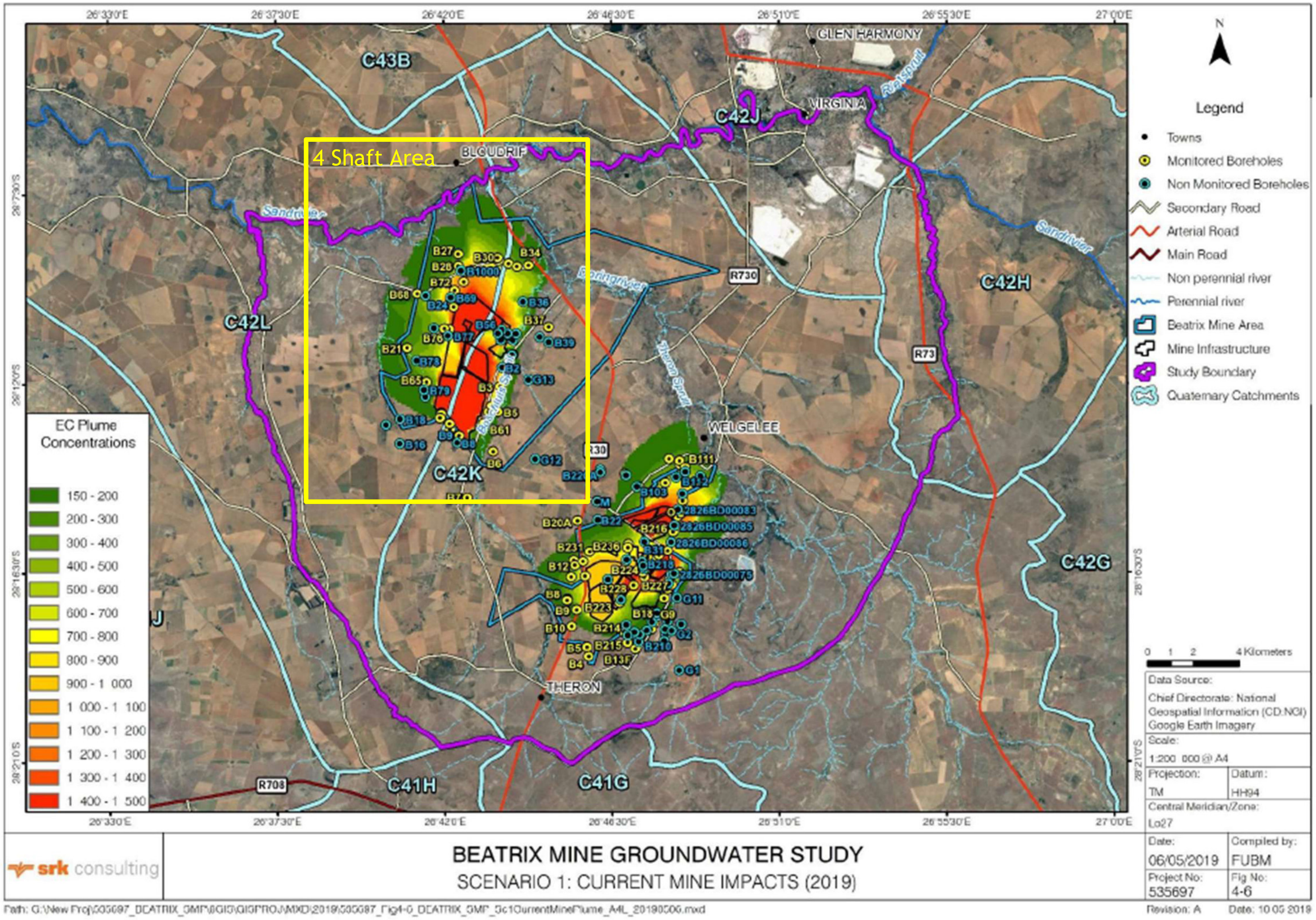


Figure 12-2: Scenario 1: Current Mine Impact (2019) (SRK , 2019)

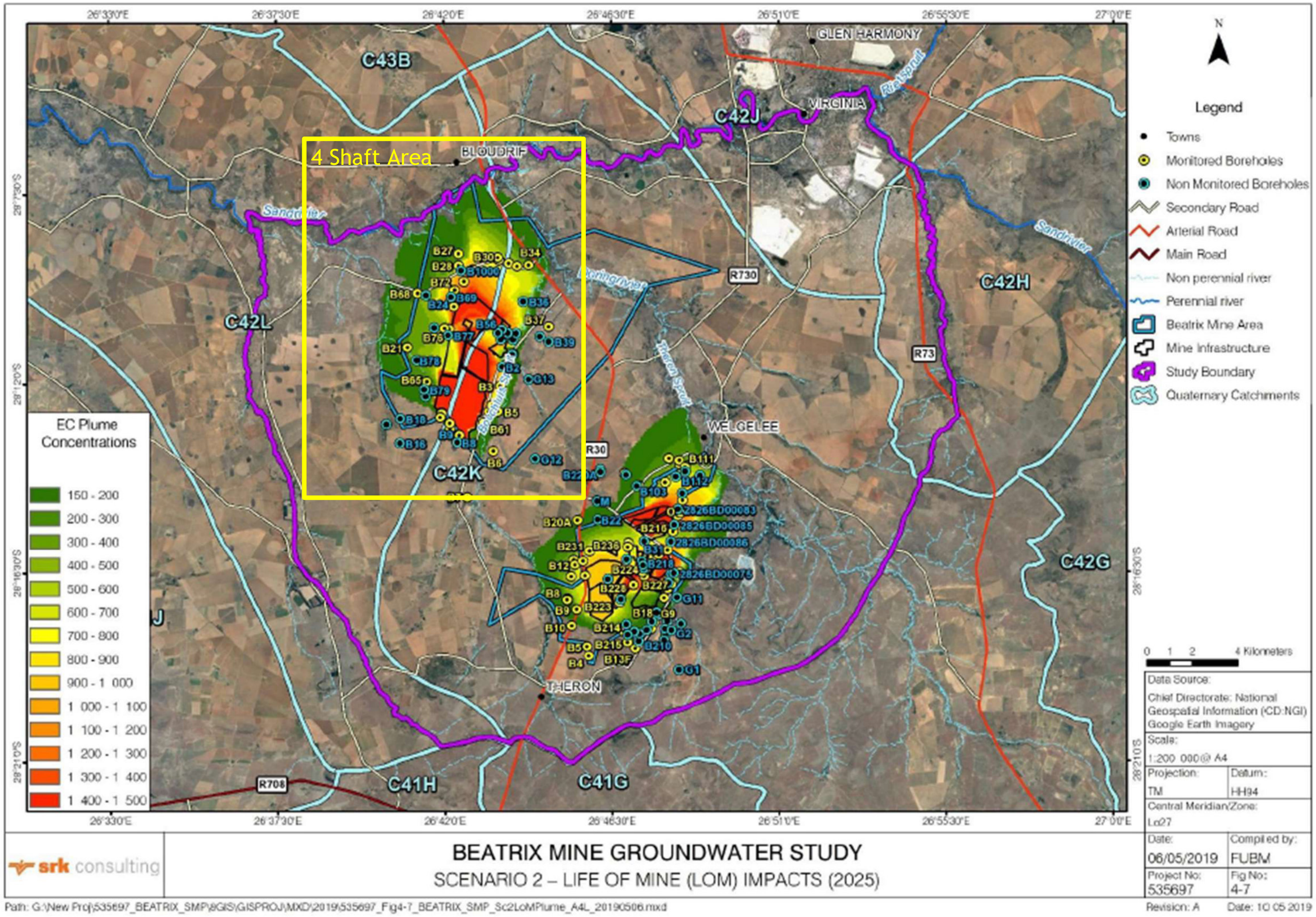


Figure 12-3: Scenario 2: Life of Mine Impact (2025) (SRK , 2019)

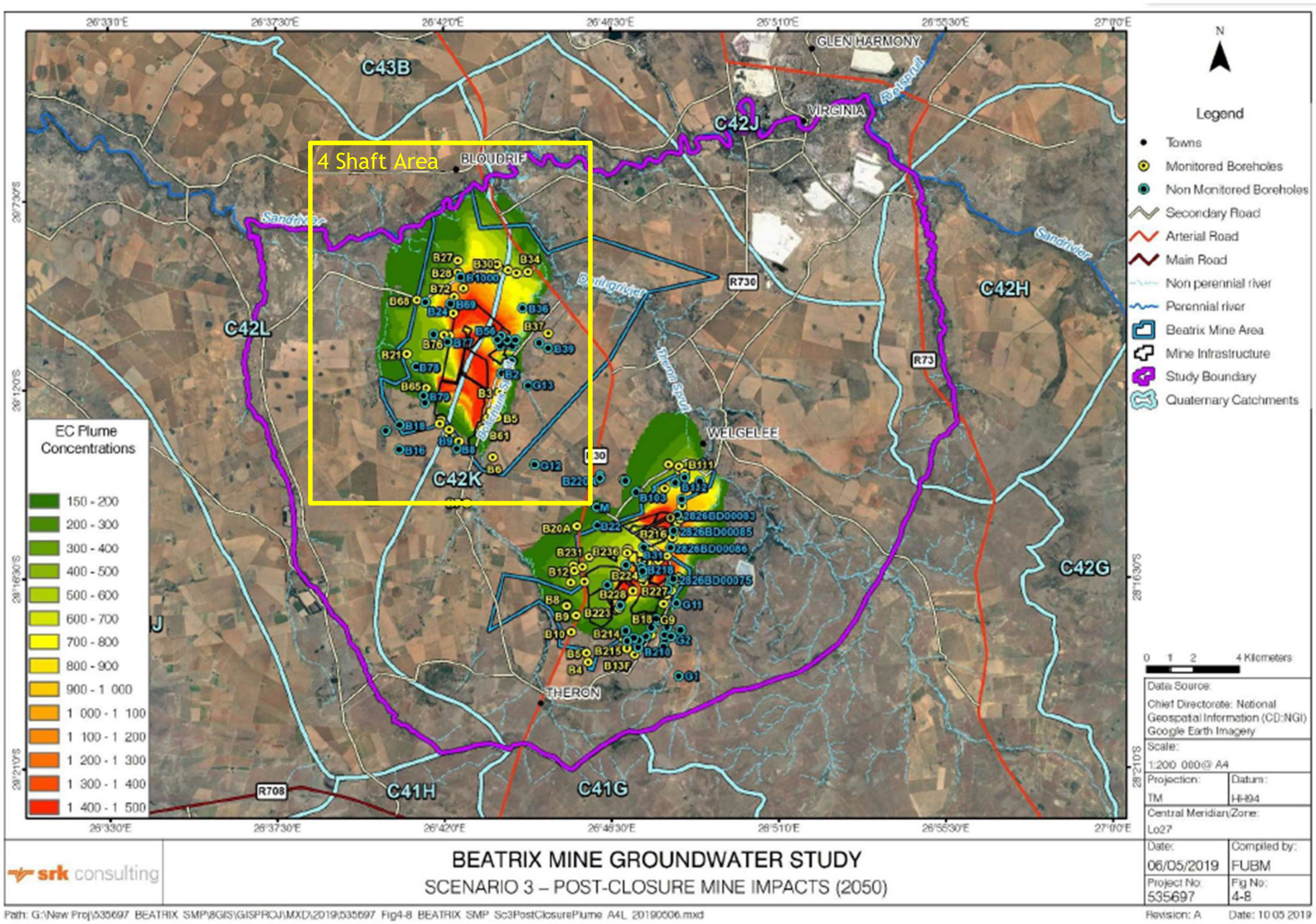


Figure 12-4: Scenario 3: Post closure Mine Impact (2050) (SRK , 2019)

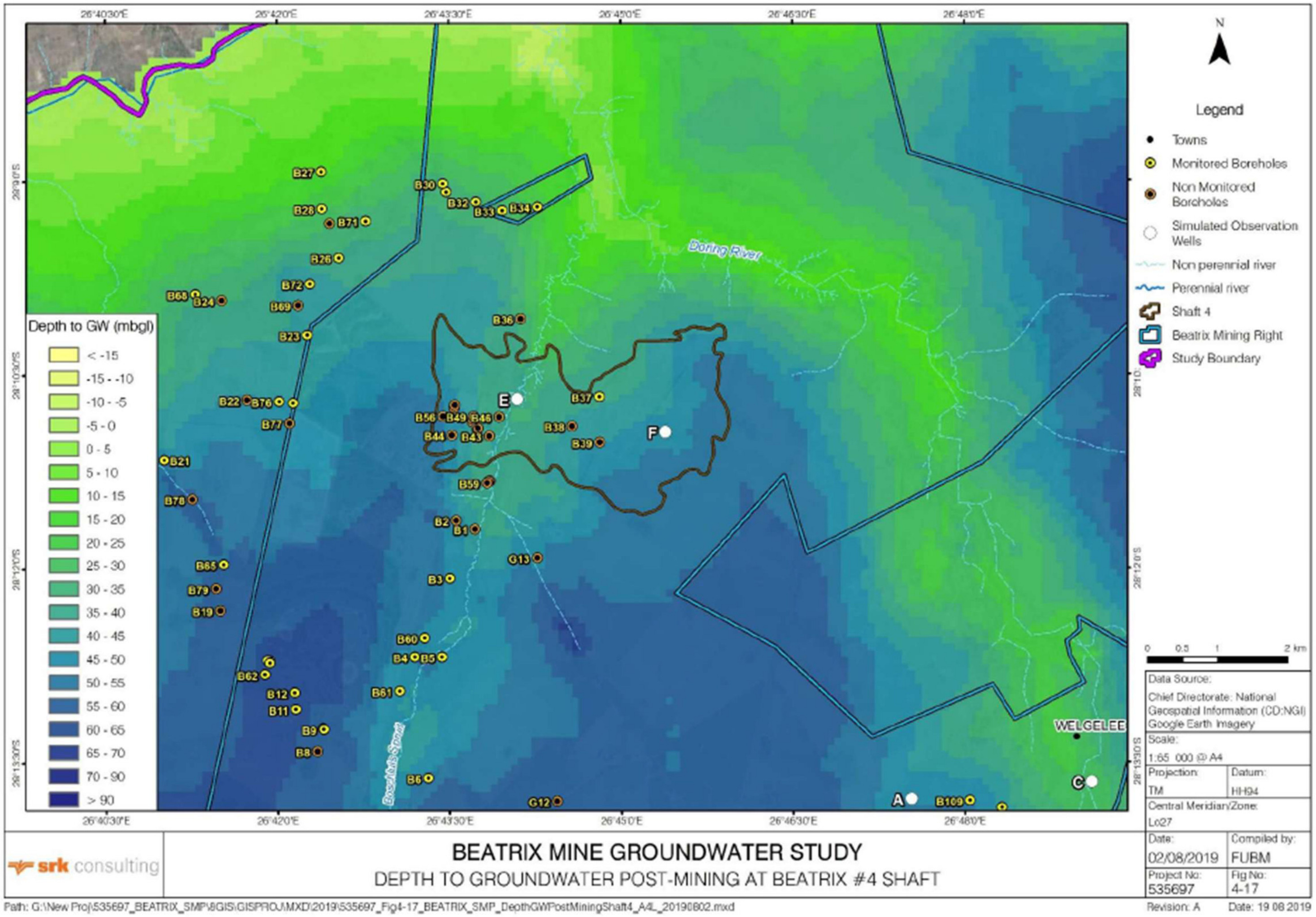


Figure 12-5: Depth to groundwater post-mining at Beatrix 4 Shaft (SRK , 2019)

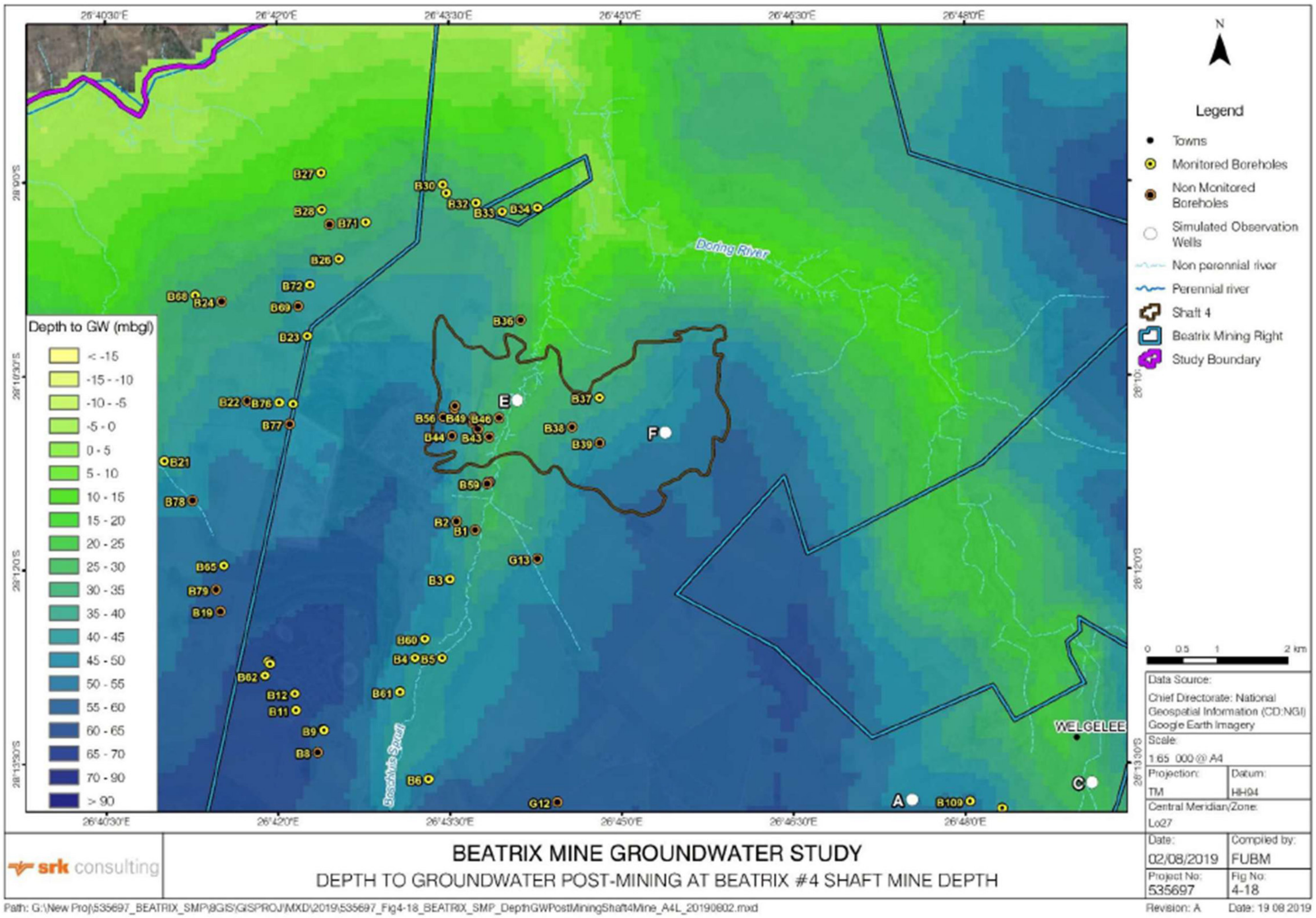


Figure 12-6: Depth to groundwater post-mining at Beatrix 4 Shaft mine depth (SRK , 2019)

12.6 Surface Water

Beatrix 4 Shaft is located within both the C42K and C42L quaternary catchments (Figure 12-7), which form part of the Middle Vaal Water Management Area (WMA 9). These catchments fall within the broader Vaal Drainage Region, which ultimately drains to the Bloemhof Dam on the Vaal River. The key surface water features receiving runoff from the Beatrix shaft complex include the Boschluis Spruit, the Doring River, and the Sand River. These rivers and their associated wetlands form critical ecological receptors in the local catchment.

The management of surface water at Beatrix 4 Shaft is particularly important due to the non-perennial nature of the streams, the regional prevalence of salinity and water quality issues, and the sensitivity of local aquatic ecosystems to additional mine-related pressures (DWS, 2014a) (RHP, 2005).

12.6.1 Hydrological Setting

Surface water drainage in the Beatrix 4 Shaft area is primarily directed north-eastward, in alignment with the natural slope of the landscape. Drainage from the site ultimately reports to the Boschluis Spruit, a non-perennial stream situated along the eastern boundary of the shaft. Downstream, the Boschluis Spruit converges with the Doring River, which subsequently flows into the Sand River before entering the Bloemhof Dam.

Both the Boschluis Spruit and the Theronspruit are characterised by highly seasonal flows, with runoff strongly dependent on summer rainfall. According to the approved EMPr (2004), mean annual runoff is estimated at 10.82 Mm^3 for the Boschluis Spruit and 3.47 Mm^3 for the Theronspruit. Peak flows during 20-, 50- and 100-year storm events range between 104–456 m^3/s in the Boschluis Spruit and 50–222 m^3/s in the Theronspruit, highlighting the flashy nature of these systems.

12.6.2 Surface Water Infrastructure and Management

The presence of extensive mine infrastructure has significantly modified natural drainage pathways. To manage water quality and prevent uncontrolled discharges, a stormwater management network of engineered channels and pipelines has been constructed.

- Clean runoff is diverted around disturbed areas to prevent contamination.
- Dirty water is captured and directed to evaporation dams, where it is contained and managed in a controlled manner.

This system is aligned with DWS requirements to maintain separation between clean and dirty water and is critical to compliance with catchment management objectives (DWS, 2014a).

12.6.3 Catchment Context: Sand-Vet and Middle Vaal System

The Beatrix 4 Shaft complex forms part of the Sand-Vet catchment, which is heavily regulated and under pressure from multiple water users. River health in this system has been reported as fair to poor (RHP, 2005). Dams in the catchment release little or no flow for ecological requirements due to competing demand for irrigation and domestic water supply.

Several river reaches experience extreme flow modification:

- In winter months, flows are often made up almost entirely of treated sewage effluent, supplemented by irrigation return flows and industrial discharges (RHP, 2005).
- Seepage through the Allemanskraal Dam provides a small baseflow downstream, but upstream reaches are frequently dry outside of the rainy season.

Recent assessments confirm that elevated salinity and Total Dissolved Solids (TDS) are persistent water quality issues across the Middle Vaal WMA, driven by mining, irrigation return flows, and sewage inflows (DWS, 2009) (WRC, 1996). Salinity has been identified as a catchment-wide priority concern by the DWS Resource Quality Objectives (RQO) process.

12.6.4 Water Quality Pressures

The Sand-Vet system is affected by multiple pressures, several of which are relevant to the Beatrix 4 Shaft area:

- Mining activities: contribute to salinity and heavy metal contamination (DWS, 2009).
- Irrigation return flows: introduce high salt loads and agrochemicals.
- Urban effluent: sewage works in Welkom, Virginia, and Odendaalsrus frequently experience spills due to poor maintenance and under-capacity (RHP, 2005).
- Alien invasive species: particularly bass, have displaced indigenous fish species, including the Near Threatened largemouth yellowfish (*Labeobarbus kimberleyensis*).

Fish health is typically good during the summer rainy season, but deteriorates during low-flow winter months. In some reaches, salt encrusts rocks and isolated pools remain the only refugia for aquatic species (RHP, 2005).

12.6.5 Ecological Status and Sensitivity

According to the DWS (2014a), the Present Ecological State (PES) of the local rivers is variable:

- Doring River – Largely natural (PES: B), with ecosystem functions essentially unchanged.
- Boschluis Spruit – Moderately Modified (PES: C), with habitat loss but functional processes still intact.
- Sand River – Moderately Modified (PES: C), with altered flows and biotic changes.

The Doring and Sand Rivers are classified as having high EI due to the presence of protected species. All three rivers have Moderate Ecological Sensitivity (ES), meaning that flow reductions or water level changes can lead to rapid habitat loss, especially in smaller streams.

The Boschluis Spruit and Doring River are classified as Endangered Lower Foothill systems, while the Sand River is a Critically Endangered Lowland River. None of these rivers are formally protected.

12.6.6 Eco-Status Summary

A summary of the eco-status and current impacts on local rivers is provided in Table 12-3.

Table 12-3: Summary of the Eco-status and impacts on local rivers (DWA, 2014)

Quaternary Catchment	Water Resource	Present Ecological State (PES)	Ecological Importance (EI)	Ecological Sensitivity (ES)	Current Impacts
C42K	Boschluis Spruit	C Moderately Modified	MODERATE	MODERATE	Roads, agriculture, trampling, erosion, chicken farming and mining.
C42K	Doring River	B Largely Natural	HIGH	MODERATE	Roads, mining with small dams, slime dams, agriculture and erosion.
C42L	Sand River	C Moderately Modified	HIGH	MODERATE	Roads, instream weirs, agriculture and erosion. After merging with the Palmietkuilspruit, the Sand River is also impacted by irrigation from channel (Allemanskraal dam), return flows and alien invasive plants.

12.6.7 Conclusion

Beatrix 4 Shaft lies within a hydrologically sensitive area where natural drainage has been significantly modified by mining infrastructure and catchment-wide water use pressures. While stormwater management systems at the shaft are designed to reduce uncontrolled discharges, the non-perennial and ecologically sensitive nature of the Boschluis Spruit, Doring and Sand Rivers increases vulnerability to additional impacts.

The Sand-Vet system already faces cumulative pressures from irrigation abstraction, sewage effluent, industrial activities, and mining-related salinity. Local rivers downstream of Beatrix 4 Shaft are therefore at risk of further ecological degradation if mine water management is not maintained effectively. Continuous monitoring, compliance with RQO, and implementation of catchment-level mitigation measures remain essential to safeguard surface water resources in the Middle Vaal WMA (DWS, 2014a) (RHP, 2005).

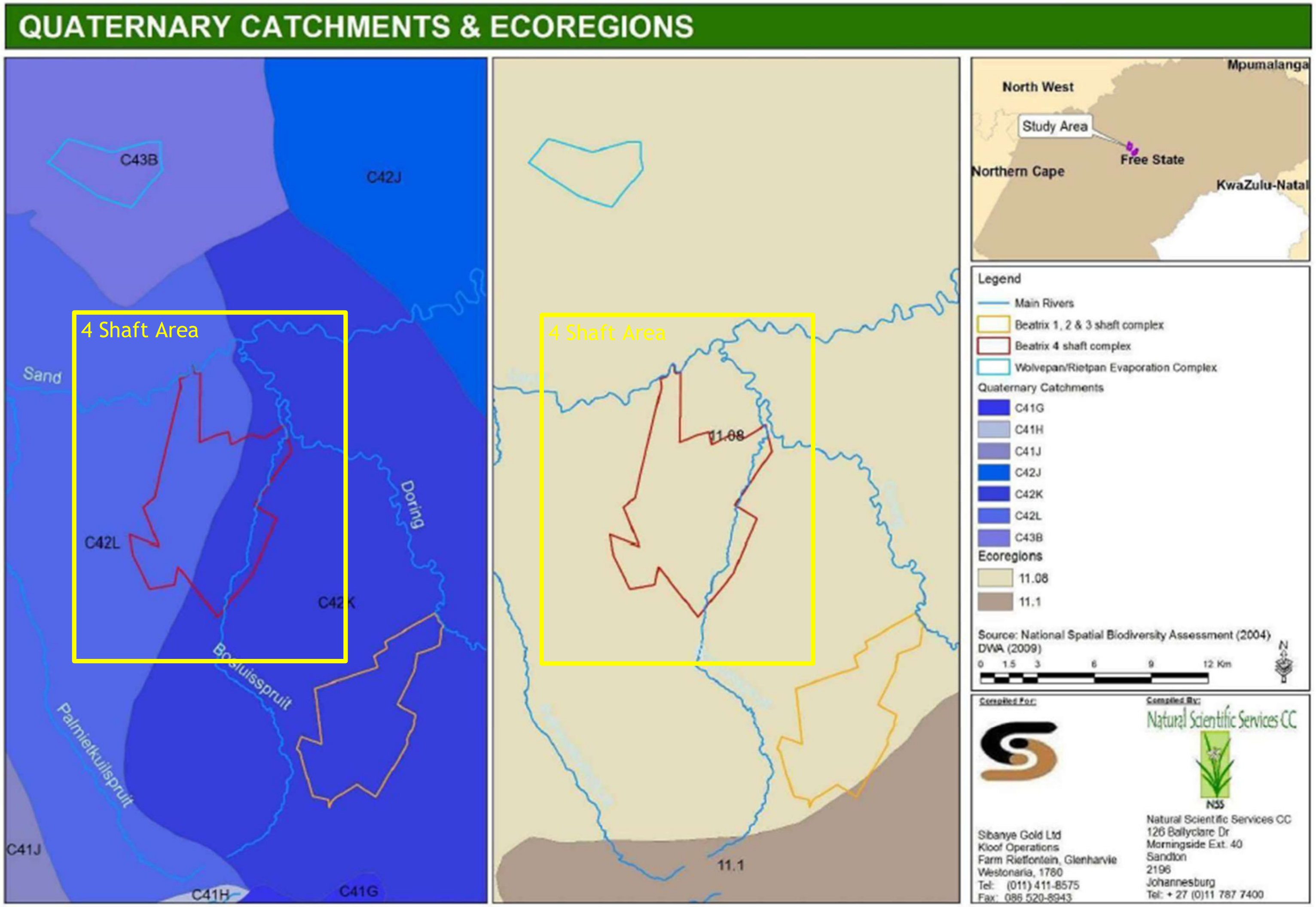


Figure 12-7: Quaternary catchments and Ecoregions (NSS, 2016a)

12.7 Wetlands

The information in this section has been derived from the Biodiversity Baseline Assessment Report, Section D: Wetland Assessment, compiled by NSS (NSS, 2016b) attached in Appendix C.

12.7.1 Wetland Types

Beatrix 4 Shaft is closely associated with the Boschluis Spruit, a non-perennial tributary located along the eastern margin of the shaft complex. The Boschluis Spruit supports an extensive channelled valley-bottom wetland system, which acts as the primary receptor of surface runoff, seepage, and stormwater discharges from shaft infrastructure, including evaporation dams and TSFs. The location and extent of these wetlands are illustrated in Figure 12-8.

In addition to the valley-bottom system, seep wetlands occur to the west and south of the shaft. These are perched on shallow slopes and are supported by both natural groundwater discharge and seepage from mining facilities. Finally, several depressional wetlands (pans) occur in the wider landscape. Many of these natural pans have been altered for agriculture or converted into evaporation dams, reducing their ecological integrity but retaining limited hydrological function.

12.7.2 Present Ecological State

The Boschluis Spruit valley-bottom wetland is assessed as being in a Moderately Modified state (PES Category C). The system still maintains connectivity and hydrological function but is visibly degraded by bank erosion, rubble dumping, alien vegetation (*Tamarix* and *Opuntia* spp.), and altered flows from mine infrastructure.

The seep wetlands to the west and south have been disturbed by berm construction, compacted soils, and stormwater diversions. Vegetation communities are dominated by disturbance-tolerant species rather than natural hydrophilic taxa. The depressional wetlands (pans) are heavily altered, with evaporation ponds showing high salinity and poor water quality.

The PES scores for each wetland type are summarised in Tables 3-3 to 3-7 of the NSS Wetland Assessment, attached in Appendix C.

12.7.3 Ecosystem Services

Despite modification, wetlands associated with Beatrix 4 Shaft continue to provide critical ecosystem services. The Boschluis Spruit valley-bottom wetland contributes to streamflow regulation, sediment trapping, and nutrient assimilation, buffering downstream water quality in the Sand River system. It also functions as an ecological corridor, supporting wetland-dependent flora and fauna within a fragmented mining and agricultural landscape.

The seep wetlands support groundwater–surface water interactions and contribute to nitrate and phosphate removal and toxicant assimilation. Although degraded, the depressional wetlands act as temporary water storage areas during high rainfall events and occasionally support congregations of waterbirds of conservation importance.

The WET-EcoServices outputs used in the NSS assessment demonstrate that the Boschluis Spruit wetlands consistently scored higher for regulating and supporting services, while depressional systems scored lower but retained some hydrological functions.

12.7.4 Ecological Importance and Sensitivity

The Boschluis Spruit and its valley-bottom wetlands are assessed as having Moderate to High ecological importance and sensitivity. This is due to their role in biodiversity maintenance, nutrient cycling, hydrological regulation, and their function as part of a regional ecological corridor within the Sand River catchment.

The seep wetlands have Moderate functional importance, reflecting their role in sediment trapping and nutrient removal despite lower biodiversity integrity. The depressional wetlands generally score Low to Moderate Ecological Importance and Sensitivity (EIS), but local biodiversity significance is elevated where waterbirds utilise these systems.

The EIS ratings for wetland and river systems are presented in Table 2-1 of the NSS Wetland Assessment, attached in Appendix C.

12.7.5 Key Impacts

Wetlands surrounding 4 Shaft are exposed to both mining and agricultural pressures. Seepage from TSFs and evaporation dams contributes to elevated sulphate and salinity in valley-bottom systems. Flow regimes are altered by stormwater diversions, dirty water collection, and wastewater discharges. Vegetation loss is driven by alien invasive species, rubble dumping, and cultivation.

The depressional wetlands, especially those repurposed as evaporation dams, are severely impacted by mine-affected water, reducing biodiversity and habitat quality. Collectively, these pressures mean the Boschluis Spruit valley-bottom wetland is the most sensitive and vulnerable receptor within the 4 Shaft environment.

12.7.6 Conclusion

Wetlands in the Beatrix 4 Shaft area are moderately to heavily modified, yet they remain critical for hydrological and ecological functions. The Boschluis Spruit valley-bottom wetland is the most significant receptor and requires priority management. The seep wetlands and depressional systems, though degraded, continue to regulate flows, trap sediments, and assimilate nutrients.

In conclusion, the wetland environment of Beatrix 4 Shaft is of medium to high significance, with management interventions required to prevent further decline. These include focused protection and rehabilitation of the Boschluis Spruit wetlands, improved stormwater and seepage management and alien invasive species control programmes.

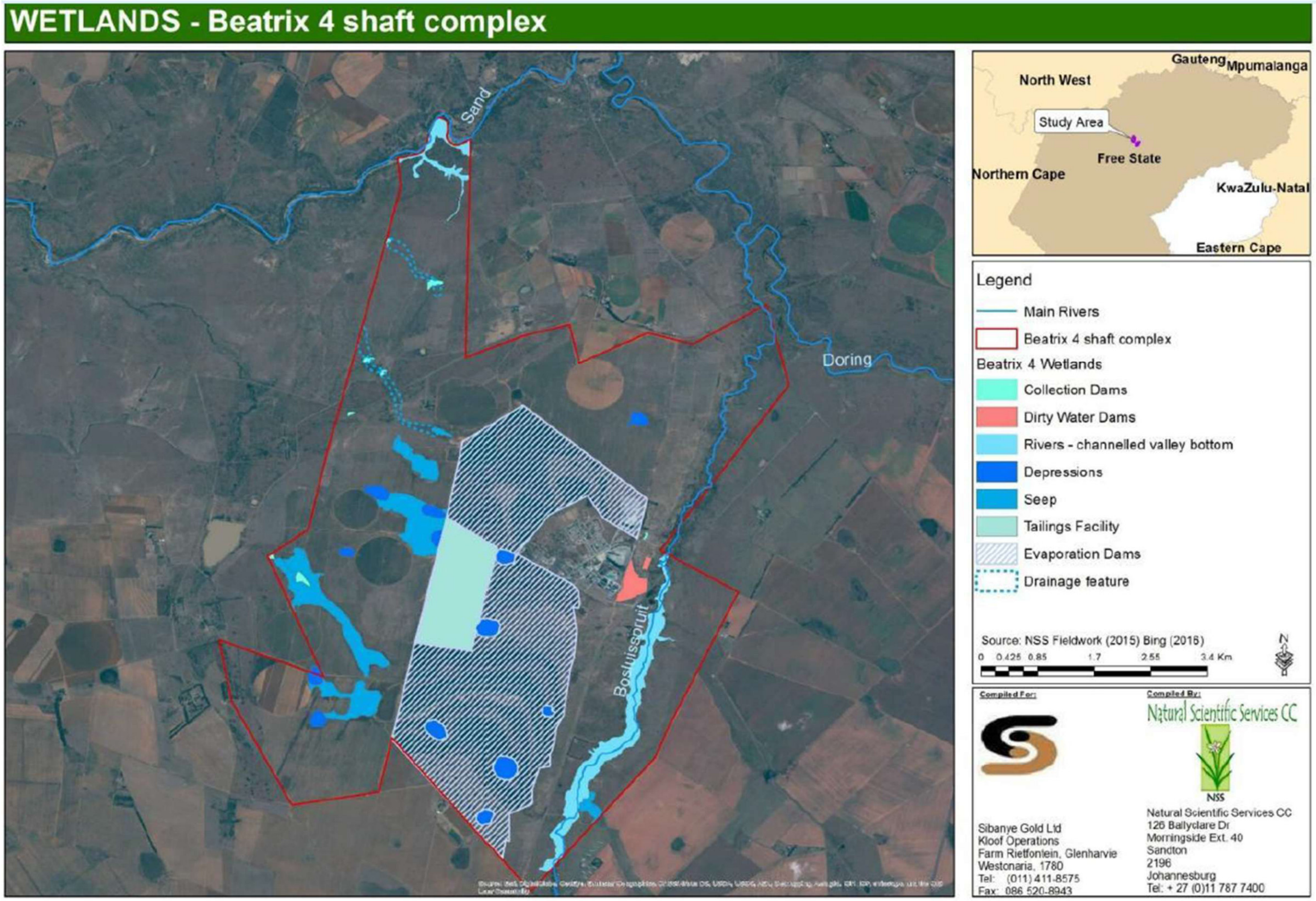


Figure 12-8: Wetland Systems – Beatrix 4 Shaft (desktop delineated) (NSS, 2016b)

12.8 Flora

The information in this section has been derived from the Biodiversity Baseline Assessment Report (NSS, 2016a), and Draft Biodiversity and Action Plan Report, compiled by NSS.

12.8.1 Regional Vegetation Context

The Beatrix Mine falls within the Grassland Biome (Figure 12-9), which is one of South Africa's most extensive yet threatened biomes. It is globally recognised for its biodiversity and high level of endemism, but also for the degree to which it has been transformed by agriculture and other land uses. Within the MR area, the dominant vegetation type is classified as Gh10 Vaal-Vet Sandy Grassland. In addition to this, Aza5 Highveld Alluvial Vegetation is found along drainage lines (Figure 12-10).

The Vaal-Vet Sandy Grassland is a karroid, low-tussock type of grassland dominated by *Themeda triandra* (Red Grass). Under conditions of erratic rainfall or heavy grazing, this species is replaced by *Elionurus muticus* (Wire Grass), *Cymbopogon pospischilii* (Turpentine Grass) and *Aristida congesta* (Steekgras / Tassel Three-awn), which are less palatable and reduce veld quality. This vegetation unit is regarded as Endangered since more than 63% has already been converted to agriculture and only 0.3% is formally conserved. Highveld Alluvial Vegetation, by contrast, is listed as Least Threatened, although it is prone to invasion by alien plants and to degradation through overgrazing due to its fertile soils and high water availability.

The Western Free State Clay Grassland occurs in flat bottomlands with embedded salt pans. It is relatively species-poor, but ecologically significant due to its pan systems. Although classified as Least Threatened, nearly 20% has been transformed by cultivation, and none is protected in statutory conservation areas. The Highveld Salt Pans are unique landscape features with concentric zonation of vegetation and are highly sensitive to trampling and overgrazing. Collectively, these vegetation types highlight the ecological value and conservation importance of the Beatrix area.

12.8.2 Floral Communities and Habitat Diversity

The Beatrix Mine area supports a mosaic of more than twenty distinct floral communities ranging from climax grasslands to wetland, shrubveld, and disturbed habitats. Riparian and wetland systems are dominated by *Vachellia (Acacia) karroo* (Sweet Thorn) with *Phragmites australis* (Common Reed) and *Typha capensis* (Bulrush) in wetter zones. *Juncus effusus* (Soft Rush) dominates depressions and seeps, while *Kyllinga* (Spike Sedge) and *Eragrostis curvula* (Weeping Lovegrass) characterise pan margins.

Grassland communities include climax grassland dominated by *Themeda triandra* (Red Grass), Themeda-Berkheya hydromorphic grassland with *Berkheya* spp. (Daisy Thistles), and rocky outcrops characterised by *Themeda triandra* (Red Grass) and *Pellaea calomelanos* (Black Fern). Shrubveld elements include Acacia-Asparagus shrubveld with *Asparagus laricinus* (Bushman's Asparagus), Chrysocoma-Themeda shrubveld with *Chrysocoma ciliata* (Yellow Bush), and karroid scrubland with *Mestoklema tuberosum* (Stone Plant).

Disturbed communities are widespread in cultivated or abandoned lands and transformed seep zones. Alien-dominated bush clumps are often formed by *Tamarix ramosissima* (Salt Cedar) and *Opuntia ficus-indica* (Prickly Pear). Despite these pressures, intact climax grassland patches and riparian strips remain ecologically significant, functioning as biodiversity refuges and corridors in a largely transformed agricultural landscape.

12.8.3 Conservation Important Plant Species

Several plant species of conservation importance have been recorded within the Beatrix Mine area or are expected to occur based on habitat suitability. Confirmed species include:

- *Boophone disticha* (Bushman's Poison Bulb).
- *Crinum bulbispermum* (Orange River Lily).
- *Eucomis autumnalis* (Pineapple Lily).
- *Hypoxis hemerocallidea* (African Potato).
- *Brunsvigia* spp. (Candelabra Flower).
- *Delosperma cf. leendertziae* (Trailing Ice Plant).

These species are valued both ecologically and culturally. Several are widely used in traditional medicine and are therefore at risk from unsustainable harvesting. Others, such as bulbous taxa, are slow-growing and particularly vulnerable to disturbance. They are afforded varying levels of protection under the Management: Biodiversity Act, 2004 (Act No. 39 of 2004) (NEMBA) and provincial conservation ordinances. Their presence underscores the need for careful management of grassland and wetland habitats to ensure their persistence

12.8.4 Grazing and Land Use Influence

The vegetation of the Beatrix area is heavily influenced by grazing regimes. The natural sweetveld grassland is palatable throughout the year, supporting a high carrying capacity. Historically, this veld sustained large migratory herds of herbivores that grazed intensively and then moved on, allowing for natural rest and recovery. Today, livestock grazing is more static and continuous, often exceeding the veld's ecological carrying capacity.

Overgrazing leads to the loss of climax grass species such as *Themeda triandra* (Red Grass) and their replacement by less palatable species such as *Elionurus muticus* (Wire Grass). It also accelerates soil erosion, reduces the regenerative potential of grassland communities, and creates conditions favourable to invasive alien species. While veld recovery remains possible where the seed bank is intact and grazing pressure is reduced, areas subjected to prolonged overgrazing may experience long term ecological degradation

12.8.5 Invasive Alien Plants

Invasive alien plants pose a major threat to floral integrity at Beatrix. A survey conducted as part of the Biodiversity Management and Action Plan recorded a high diversity of invasive species, particularly in transformed habitats. However, invasives are also encroaching into sensitive areas such as wetlands, ridges, rocky outcrops, and riparian corridors.

Prominent invaders include *Tamarix ramosissima* (Salt Cedar) and *Opuntia ficus-indica* (Prickly Pear), both listed under the NEMBA Alien and Invasive Species Regulations as requiring compulsory control. Their spread reduces the availability of grazing, alters fire regimes, and displaces indigenous flora. The persistence of these invasives highlights the importance of sustained control programmes, including mechanical clearing, targeted herbicide use where appropriate, and long term monitoring

12.8.6 Ecological and Conservation Significance

The floral diversity of the Beatrix area is significant for several reasons. Firstly, the dominance of Gh10 Vaal-Vet Sandy Grassland, an Endangered ecosystem, elevates the conservation value of the remaining intact patches. Secondly, the occurrence of unique azonal vegetation types such as Highveld Alluvial Vegetation, Clay Grassland, and Salt Pans provides specialised habitats that are increasingly rare in the broader Free State landscape.

Thirdly, the presence of species of conservation importance demonstrates that these habitats continue to support populations of ecologically and culturally valuable taxa. Many of these plants also contribute to traditional medicine and cultural practices in surrounding communities, adding a socio-ecological dimension to their conservation. Finally, intact grassland and riparian corridors provide ecological connectivity in a heavily transformed agricultural matrix, functioning as refuges for both flora and fauna.

12.8.7 Management Implications

Protecting floral biodiversity at Beatrix will require a multifaceted management approach. Intact climax grasslands and riparian zones should be mapped and designated as high sensitivity areas, protected from further disturbance, and incorporated into mine closure and rehabilitation planning. Buffer zones around wetlands, pans, and riparian corridors are essential to safeguard their ecological functions.

The control of invasive alien plants must remain a long term priority, with emphasis on high-risk species such as *Tamarix ramosissima* (Salt Cedar) and *Opuntia ficus-indica* (Prickly Pear). Rehabilitation programmes should aim to restore disturbed areas with indigenous grassland species and, where possible, propagate and reintroduce Conservation Important species. Monitoring programmes should be established to track vegetation change, grazing impacts, and the effectiveness of alien control interventions.

Stakeholder engagement, particularly with local communities and traditional users of medicinal plants, is recommended to ensure sustainable use and conservation of Conservation Important (CI) species. By integrating these measures into mine planning and operations, Beatrix can contribute to both ecological resilience and biodiversity stewardship at a regional scale.

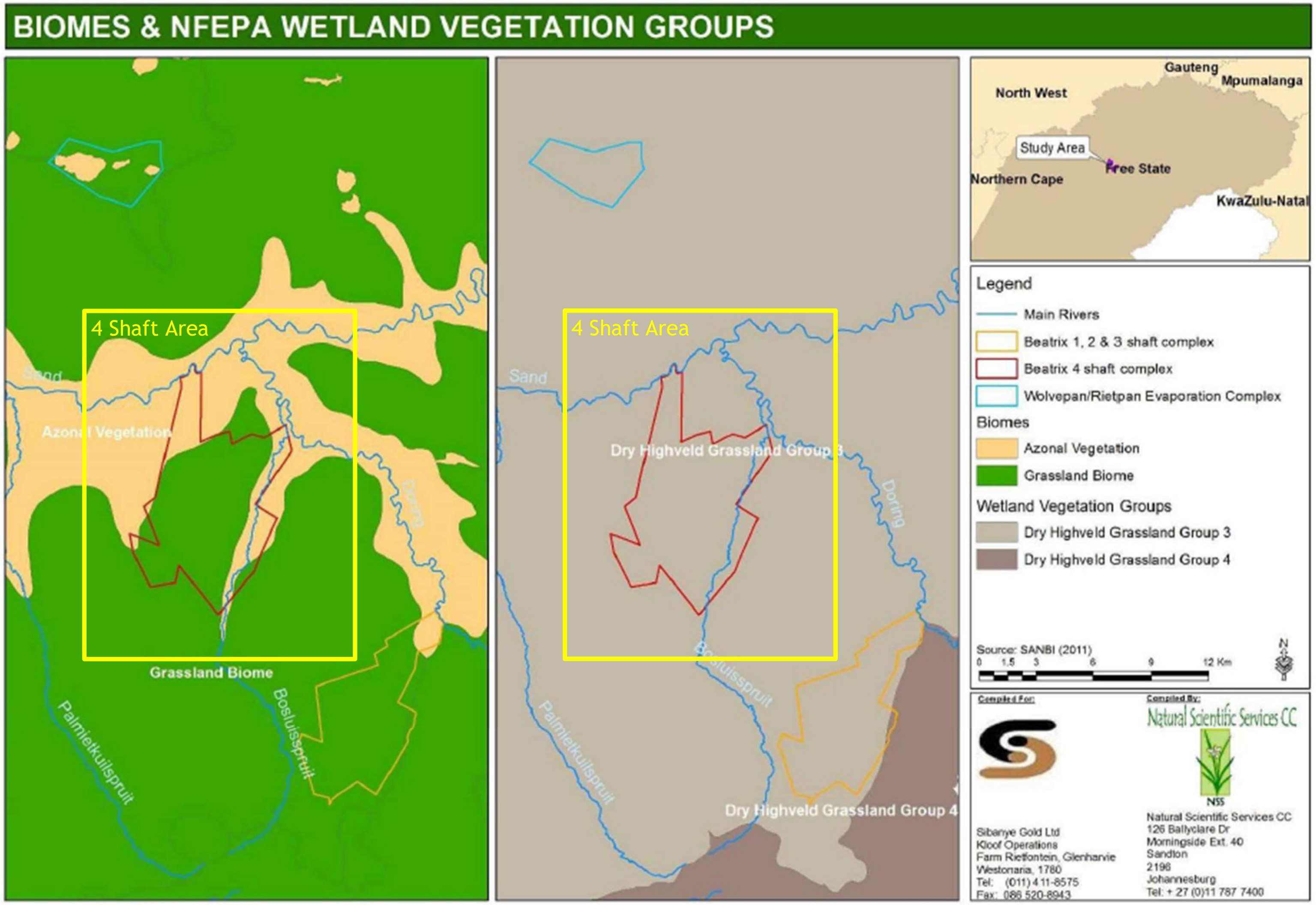


Figure 12-9: Biomes and wetland vegetation groups (NSS, 2016a)

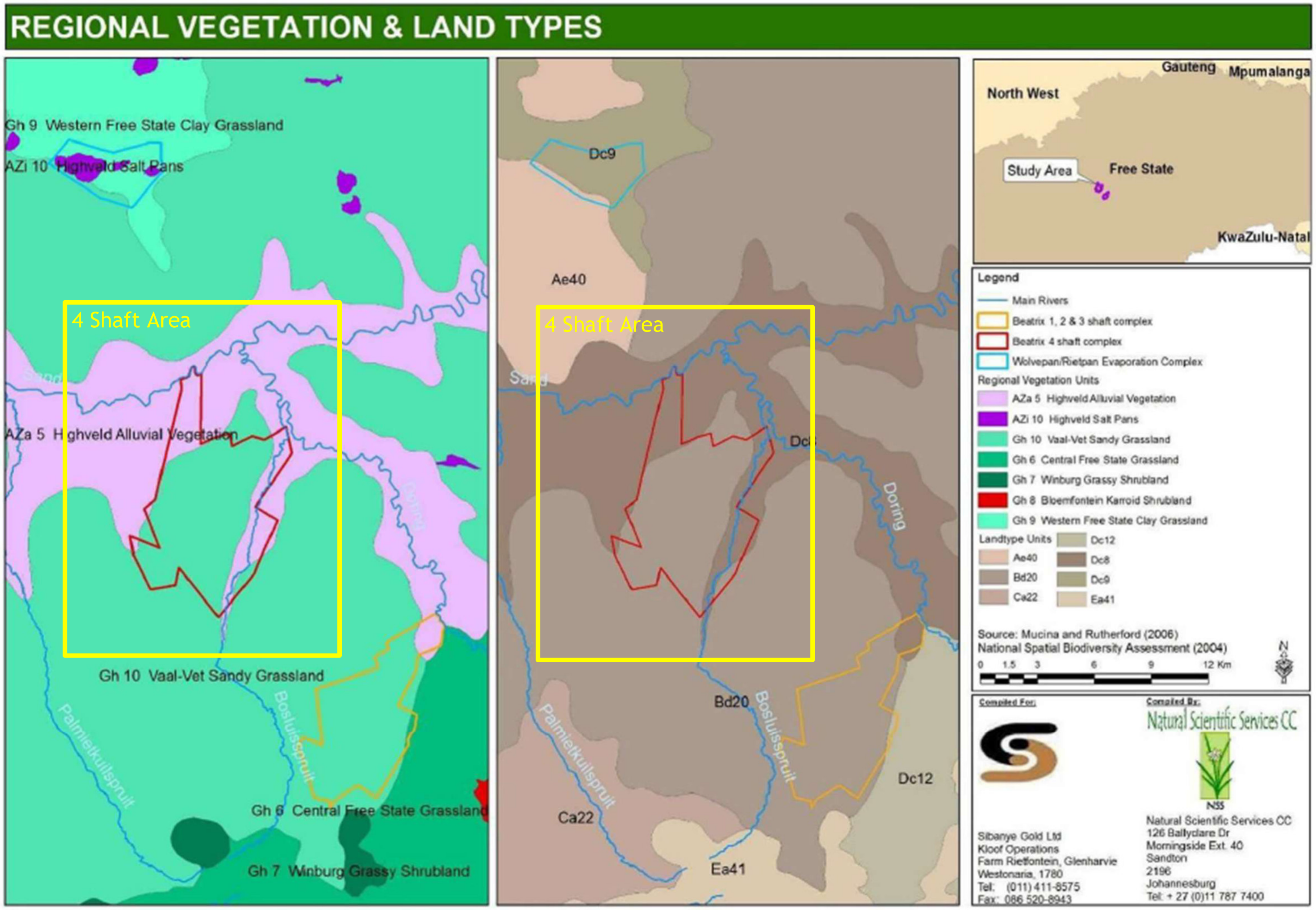


Figure 12-10: Regional vegetation and land types (NSS, 2016a)

12.9 Fauna

The information in this section has been derived from the Biodiversity Baseline Assessment Report, Section C: Faunal Assessment, compiled by NSS (NSS, 2016c) attached in Appendix D.

A faunal baseline study was undertaken to evaluate the diversity, conservation importance, and ecological function of animal species occurring within and around the Beatrix mining area. The assessment included mammals, birds, reptiles, amphibians, butterflies, scorpions, and odonata (dragonflies and damselflies). The study combined a desktop review of distribution records with on-site field surveys conducted over three sampling periods during late 2015 and early 2016.

Survey methods included live-trapping and camera-trapping for mammals, acoustic monitoring for bats, visual encounter surveys for herpetofauna, sweep-netting for butterflies and odonata, and artificial cover mats for small reptiles and amphibians. Data from regional atlases such as MammalMAP, the Southern African Bird Atlas Project, FrogMAP and LepiMAP were incorporated to provide context on regional distribution and potential species occurrence. The assessment therefore provides both site-specific and regional scale insights into faunal biodiversity.

12.9.1 Mammals

A total of sixty-three indigenous mammal species are expected to occur in the region, with twenty-two species confirmed during field surveys. The species recorded represent a mix of small to medium-sized carnivores, generalist herbivores, and burrowing mammals.

Common mammals included the Cape Ground Squirrel (*Xerus inauris*), which occurs in colonies in open grasslands; the Yellow Mongoose (*Cynictis penicillata*), often observed near burrows along disturbed edges; and the Porcupine (*Hystrix africaeaustralis*), identifiable by quills found near burrow entrances. Antelope such as the Common Duiker (*Sylvicapra grimmia*) were frequently encountered, and the Black-backed Jackal (*Canis mesomelas*) was noted, indicating that generalist predators are still present.

Species of conservation importance included the Aardvark (*Orycteropus afer*), an ecologically significant species due to its burrowing behaviour which creates shelter for many other animals. The Southern African Hedgehog (*Atelerix frontalis*), which is considered Near Threatened, was also confirmed. Other species of interest include the Cape Fox (*Vulpes chama*) and Bat-eared Fox (*Otocyon megalotis*), both sensitive to habitat degradation but persisting in grasslands. Importantly, habitat within the Beatrix area may support the Vulnerable Black-footed Cat (*Felis nigripes*), one of South Africa’s most threatened small carnivores.

The mammal assemblage is shaped by the transformation of grassland to agriculture and mining infrastructure, which has reduced populations of larger mammals. Nonetheless, the persistence of smaller generalist species and threatened carnivores highlights the ecological value of intact habitat patches.

12.9.2 Birds

Bird diversity was high, with one hundred and twenty-nine species recorded from the two hundred and thirty-three species expected in the region. The avifauna includes waterbirds associated with pans and wetlands, grassland specialists, raptors, and generalist species that use transformed habitats.

Of particular importance were several threatened or Near Threatened species. The African Marsh-harrier (*Circus ranivorus*, Endangered) was recorded hunting over wetlands, while the Secretarybird (*Sagittarius serpentarius*, Vulnerable) and Lanner Falcon (*Falco biarmicus*, Vulnerable) were observed in open grasslands. Both Lesser Flamingo (*Phoeniconaias minor*, Near Threatened) and Greater Flamingo (*Phoenicopterus ruber*, Near Threatened) were recorded using local pan habitats, demonstrating the significance of ephemeral wetlands for migratory waterbirds.

The Boschluis Spruit drainage line and associated dense Imperata grasslands were identified as suitable habitat for the African Grass-owl (*Tyto capensis*, Vulnerable). This nocturnal predator is highly sensitive to disturbance and serves as an indicator of grassland health. Its potential occurrence emphasises the need to safeguard riparian corridors and tall grassland patches.

Bird diversity reflects the mosaic of habitats in the Beatrix area. While transformed fields and mine infrastructure limit specialist species, grassland patches, drainage lines, and wetlands continue to support a wide range of birdlife, including species of international conservation significance.

12.9.3 Reptiles

Nineteen reptile species are expected in the study area, with seven species confirmed during fieldwork. Observations included the Cape Cobra (*Naja nivea*) and Rinkhals (*Hemachatus haemachatus*), both medically important snake species, and several small lizards such as skinks.

The Marsh Terrapin (*Pelomedusa subrufa*) is likely to occur in seasonal pans and dams, where it plays an important role in aquatic food webs. Some threatened lizards may also occur in rocky outcrops, which provide essential shelter and breeding sites. Although reptile diversity was Moderate, this is consistent with disturbed grassland habitats. Conserving rocky ridges and waterbodies is important for sustaining reptile diversity.

12.9.4 Amphibians

Thirteen amphibian species are expected, with three species confirmed during the surveys: the Guttural Toad (*Amietophrynus gutturalis*), the Common River Frog (*Amietia angolensis*), and the Clicking Stream Frog (*Strongylopus grayii*). Amphibians were mostly recorded in wetlands and ephemeral pans, which are critical breeding habitats.

The Giant Bullfrog (*Pyxicephalus adspersus*), a species of high conservation concern, is likely to occur in seasonal pans within the Beatrix area. This species requires undisturbed seasonal wetlands for successful breeding, and it is protected due to population declines caused by habitat loss, harvesting, and road mortality. The presence of suitable habitat indicates that careful management of wetland and pan systems is essential for amphibian conservation.

12.9.5 Butterflies

Fifty-three butterfly species are predicted to occur, but twelve species were recorded during surveys. While no threatened species were detected, the area is suitable for habitat-sensitive groups such as lycaenids (blues and coppers), which are associated with specific host plants.

Butterfly diversity was lower than expected, largely due to drought conditions at the time of the survey and the transformation of natural grassland into cultivated fields. Nonetheless, butterflies remain useful indicators of ecosystem health, and their presence in grassland and wetland margins highlights the ongoing value of these habitats.

12.9.6 Scorpions and Other Invertebrates

Two scorpion species were confirmed: the Lesser Thick-tailed Scorpion (*Parabuthus planicaudatus*) and the Yellow-legged Burrowing Scorpion (*Opistophthalmus glabrifrons*). Both are widespread species typical of grassland and agricultural landscapes. Their limited diversity reflects habitat disturbance, but their presence also indicates areas of intact soil and vegetation cover.

Dragonflies and damselflies were poorly represented, with only five species recorded, including the Common Bluetail (*Ischnura senegalensis*) and the Red-veined Dropwing (*Trithemis arteriosa*). Diversity was constrained by the drought conditions during the survey period, but their presence demonstrates that aquatic habitats remain functional despite disturbance.

12.9.7 Conservation Findings

The faunal assessment confirms that Beatrix Mine supports a Moderate level of biodiversity, with several threatened and CI species present or potentially occurring. The sensitivity of wetlands and pans is particularly critical, as these habitats support amphibians such as the Giant Bullfrog and waterbirds such as flamingos. Grassland patches are essential for raptors and ground-nesting birds, while rocky outcrops and drainage lines provide habitat for reptiles and small mammals.

Although large mammals are absent due to agricultural transformation and mining activity, smaller mammals such as the Aardvark, Southern African Hedgehog, and Black-footed Cat persist or are expected to occur, highlighting the importance of conserving intact habitat patches. Invertebrate diversity was lower than anticipated, but butterflies and dragonflies continue to play roles as ecological indicators.

12.9.8 Conclusion

The faunal assemblage of Beatrix reflects both the ecological significance of the area and the challenges posed by extensive land transformation. Grasslands, wetlands, and pans are especially important habitats for sustaining threatened and CI species.

Effective management should focus on:

- Protecting wetlands and pans as high sensitivity habitats.
- Monitoring threatened mammals such as Aardvark and Black-footed Cat.
- Implementing measures to protect grassland raptors and the African Grass-owl.

- Safeguarding amphibian breeding habitats, particularly those of the Giant Bullfrog.
- Restoring and managing grassland to support butterfly and invertebrate diversity.

Despite considerable pressures from agriculture and mining, the Beatrix Mine area retains ecological value and presents an opportunity for proactive biodiversity stewardship.

12.10 Air Quality

This section has been updated using the Beatrix Operations Monthly Dustfall Monitoring Report (Aquatico Scientific, 2024).

Air quality at Beatrix Mine is managed in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA) and the associated National Dust Control Regulations (2013), which prescribe allowable dustfall rates and monitoring requirements. Beatrix 4 Shaft does not operate combustion stacks or smelting infrastructure; therefore, fugitive dust emissions are the predominant air quality consideration. Dust is primarily generated from surface disturbance, tailings storage and handling activities, haul road traffic, and wind erosion of exposed areas. To manage and assess these emissions, the mine operates a network of dustfall monitoring stations, with monthly analysis undertaken by a SANAS-accredited laboratory, and results interpreted against the regulatory non-residential dustfall limit of 1 200 mg/m^2/day (30-day average).

12.10.1 Sources of Emissions at Beatrix 4 Shaft

The predominant air emissions associated with the Beatrix 4 Shaft and its supporting infrastructure are fugitive dust emissions. These emissions are primarily generated through the handling, loading, and movement of waste rock, the deposition and reclamation activities at the TSFs, vehicle movement along unpaved haul and access roads, and the presence of exposed, unvegetated surfaces within and around the shaft complex. Although the shaft's direct operational footprint is limited, its association with nearby tailings deposition facilities results in a substantial indirect contribution to the overall dust load within the local airshed.

Under dry and windy conditions, fine particulate matter (notably PM_{10} and $PM_{2.5}$) can become readily entrained and transported beyond the mining boundary, posing a potential nuisance and health risk to surrounding land users and receptors. Periodic blasting activities and frequent vehicle traffic (including haul trucks and light-duty vehicles) further increase the likelihood of elevated particulate concentrations, particularly when dust suppression and surface stabilisation measures are insufficient or inconsistently applied.

12.10.2 Ambient Air Quality Monitoring – Beatrix 4 Shaft

Beatrix operates eight ASTM D1739-compliant dustfall monitoring stations, all classified as non-residential monitoring points. These stations measure monthly dust deposition rates (mg/m^2/day) to evaluate compliance with the National Dust Control Regulations. During the December 2024 monitoring period, seven of the eight monitoring sites were within the allowable non-residential limit of 1 200 mg/m²/day. One site, VD Merwe, recorded a dustfall rate of 1 760 mg/m²/day, which was above the guideline value; however, the site remained compliant with the regulatory exceedance frequency rule (no more than two exceedances per year and not in consecutive months).

Meteorological conditions, particularly seasonal high wind speeds from the north, were identified as a key driver of the temporary increase in dustfall levels, rather than a change in mine operations.

12.10.3 Pollutants of Concern

The primary pollutant of concern for Beatrix 4 Shaft is settleable particulate matter (dustfall), recorded as total insoluble deposition. Although not directly measured in the dustfall monitoring dataset, fine particulate fractions (PM_{10} and $PM_{2.5}$) are understood to be present in the airborne component of these emissions and are managed through operational dust suppression and occupational exposure controls.

Crystalline silica (alpha quartz) may be present in the respirable dust fraction and remains an occupational health risk, monitored through separate workplace hygiene programmes. No gaseous emissions, such as sulphur dioxide (SO_2) or oxides of nitrogen (NO_x), are associated with Beatrix 4 Shaft operations.

12.10.4 Conclusion

The dustfall monitoring results for December 2024 show that ambient dust levels in the vicinity of Beatrix 4 Shaft remain largely compliant with the applicable National Dust Control Regulations, with only one temporary exceedance which did not breach annual compliance criteria.

The findings indicate that dust is predominantly influenced by meteorological conditions, rather than abnormal mine emissions.

To maintain continued compliance and protect environmental and community receptors, Beatrix Mine should:

- Continue monthly dustfall monitoring at all established stations;
- Maintain and strengthen dust suppression measures on haul roads and exposed surfaces;
- Ensure progressive rehabilitation of disturbed areas; and
- Record and respond to any dust-related complaints transparently.

With these measures in place, air quality impacts associated with Beatrix 4 Shaft are manageable and not expected to result in significant environmental or health impacts.

12.11 Noise

This section has been derived from the Noise Monitoring Report, compiled by Acoustech Consulting (Consulting, 2025).

A noise monitoring survey was undertaken in May 2025 to determine compliance with SANS 10103:2008 (The measurement and rating of environmental noise) and the Free State Noise Control

Regulations (Provincial Notice 24 of 1998). The purpose of the assessment was to evaluate the contribution of Beatrix Mine operations to ambient noise levels in the surrounding area, with particular consideration of sensitive receptors including residential farmsteads and mine-associated housing.

12.11.1 Monitoring Locations

Noise measurements were conducted at four (4) monitoring points located around the Beatrix Mine operations. These sites represented noise-sensitive receptors situated near operational shafts and nearby agricultural homesteads:

Monitoring Point	Location Description	Coordinates	Land Use Rating
NM1	No.4 Shaft – Resident 2	28°11'31.0"S; 26°43'37.1"E	Urban
NM2	No.4 Shaft – Resident 1	28°09'38.6"S; 26°42'00.5"E	Rural
NM3	No.3 Shaft – near farmhouse	28°13'43.1"S; 26°48'27.8"E	Rural
NM4	No.1 & 2 Shafts – Wynandsfontein Farm	28°17'38.8"S; 26°47'43.5"E	Rural

At the time of monitoring, Shaft 2 and Shaft 4 were non-operational, and therefore no significant mechanical noise was emitted from these shafts.

12.11.2 Methodology

Noise monitoring was conducted on 19 May 2025, with:

- Daytime measurements: 10:50–12:39.
- Night-time measurements: 22:41–00:34.

Instrumentation and procedure included:

- Type 1 Integrating Sound Level Metre, SANAS-certified.
- Metre mounted 1.4 m above ground, free-field position.
- Settings: A-weighted, Fast response.
- Calibration before and after readings, deviation <1 dB confirmed.
- 10-minute measurement durations to stabilise LAeq data.

Results were interpreted according to SANS 10103 rating levels for day (07:00–22:00) and night (22:00–07:00) periods.

Weather conditions were suitable for acoustic measurement, with wind speeds < 11 km/h and no precipitation at time of monitoring.

12.11.3 Daytime Noise Levels

Daytime noise levels ranged from 31.9 dBA to 49.9 dBA, all of which are within the acceptable SANS rating limits for the corresponding acoustic districts.

- NM1 recorded the highest daytime level (49.9 dBA), attributable to a slightly more developed residential environment.

- NM3 recorded the lowest (31.9 dBA), reflecting a stable rural acoustic climate with minimal anthropogenic influence.

No daytime measurements indicated a disturbing noise condition (i.e., exceeding ambient levels by ≥ 5 dBA).

12.11.4 Night-time Noise Levels

Night-time noise levels remained consistently low, ranging from 30.5 dBA to 37.8 dBA. This is characteristic of quiet rural night acoustic conditions, where natural ambient levels dominate.

No mechanical mine activity contributed perceptibly to night noise levels. This result is significant, as night-time noise sensitivity is typically higher due to rest and sleep requirements.

12.11.5 Sources of Noise

The dominant contributing sound sources recorded during monitoring were:

Noise Source	Character	Relevance
Livestock movements (cattle)	Intermittent, low intensity	Typical rural soundscape
Bird calls	Natural tonal bursts	Baseline ecological acoustics
Distant vehicle activity	Sporadic	Local farm access and R30 corridor
Wind rustling vegetation	Continuous soft broadband noise	Natural background masking

Mine shafts were generally inaudible, with no tonal, impulsive, or cyclical equipment noise detected.

12.11.6 Conservation and Community Implications

The daytime noise measurements recorded across the four monitoring points ranged between 31.9 dBA and 49.9 dBA, which fall within the acceptable rating levels for the respective rural and urban acoustic districts as defined under SANS 10103:2008. The highest daytime level was observed at NM1 (near No. 4 Shaft Resident 2), reflecting its closer proximity to a more developed residential setting, although no direct mine-related noise sources were audible at the time of monitoring. The lower recorded values, such as those at NM3, are indicative of a quiet rural sound environment dominated by natural ambient conditions. Importantly, none of the locations exhibited noise levels that exceeded the threshold for a disturbing noise, which is defined in the Free State Noise Control Regulations (PN24 of 1998) as exceeding the ambient noise level by 5 dBA or more. The results therefore demonstrate that daytime activities associated with the mine were not contributing materially to environmental noise exposure at nearby receptors during the monitoring period.

12.11.7 Recommendations

The Noise Monitoring Report concludes that no immediate noise mitigation actions are required, as the mine is currently operating within the allowable noise thresholds for the surrounding land use zones. However, several precautionary and forward-looking measures are recommended to ensure continued compliance. These include maintaining a biennial noise monitoring programme to confirm that ambient noise conditions remain stable over time, particularly if operational intensity changes. Any future noise-generating activities, such as the recommissioning of shafts or installation of new ventilation or haulage infrastructure, should be screened for potential noise impacts prior to implementation, and monitored as necessary. Should any noise complaints be received from affected parties, these should be investigated by an independent acoustic specialist to verify and address the concern. Additionally, ongoing operator awareness and proactive maintenance of mechanical equipment, such as conveyors and ventilation fans, are recommended to prevent abnormal or tonal noise emissions that may alter the current acoustic environment.

12.12 Heritage

This section has been derived from the Heritage Audit undertaken by PGS Heritage (Pty) Ltd. (PSG, 2017), attached in Appendix E.

A desktop historical background study and fieldwork was undertaken for the heritage evaluation of the archaeological and historical background of the study area to establish the possible heritage resources to be found.

12.12.1 Description of the study area.

The study area is located between Welkom and Theunissen and falls within the Matjhabeng and Masilonyana Local Municipalities, Lejweleputswa District Municipality, Free State Province. It covers an area of approximately 13 877.41 hectares. Significant components of the application area are characterised by extensive farming activities in the form of extensive agricultural fields with pivot irrigation also present. For the most part maize production is undertaken within this area, although other crops such as soya beans are also grown. The Middle and Southern Sections of the study area are associated with mines and mining activities of the Beatrix Mine of Sibanye Gold, with both the Beatrix Mine Shaft 2 and Beatrix Mine Shaft 4 located within the study area. All of these mines were established during the second half of the twentieth century.

Apart from the agricultural and mining activities, infrastructural disturbance in the form of tar roads (the R30 between Welkom and Theunissen cuts through the area), provincial gravel roads, farm roads, electricity transmission lines, telephone lines, fences, buildings and structures are found within the study area. In terms of buildings and structures, several farmsteads are located within the study area. These farmsteads can be expected to comprise farmhouses of varying ages as well as farm worker accommodation, sheds, barns, silos, livestock enclosures, etc

In a topographic sense, the entire study area, apart from the river valleys, can be described a relatively flat. The Sand River cuts across the northern component of the application area, with the Boschluis Spruit running across a significant component of the application area further to the south. Several water pans and man-made dams are also located within this area.

Graves and burial grounds fall under various legislative protections, depending on factors such as where the graves are located and their age. Such legislation may include the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925), the Human Tissue Act 65 of 1983, and the Ordinance on. Excavations (Ordinance no. 12 of 1980) as well as any other provisions, laws and by-laws that may be in place

Structures older than 60 years fall under the protection of Section 34(1) of the NHRA. In the same section, the act states that such structures may not be disturbed, altered, modified or destroyed without a suitable permit from the relevant heritage authority. Significant sections of the undisturbed components of the study area comprise open grassland, interposed by scattered pockets of trees. Planted vegetation, which includes exotic trees and plants, are found in proximity to farmsteads and human occupation areas. Lanes of such planted exotic trees were also strategically planted as windbreaks and are found all over the study area.

12.12.2 Heritage Sites Identified

The heritage sites in close proximity to Beatrix 4 Shaft are illustrated in Figure 12-11 and detailed in Table 12-4.

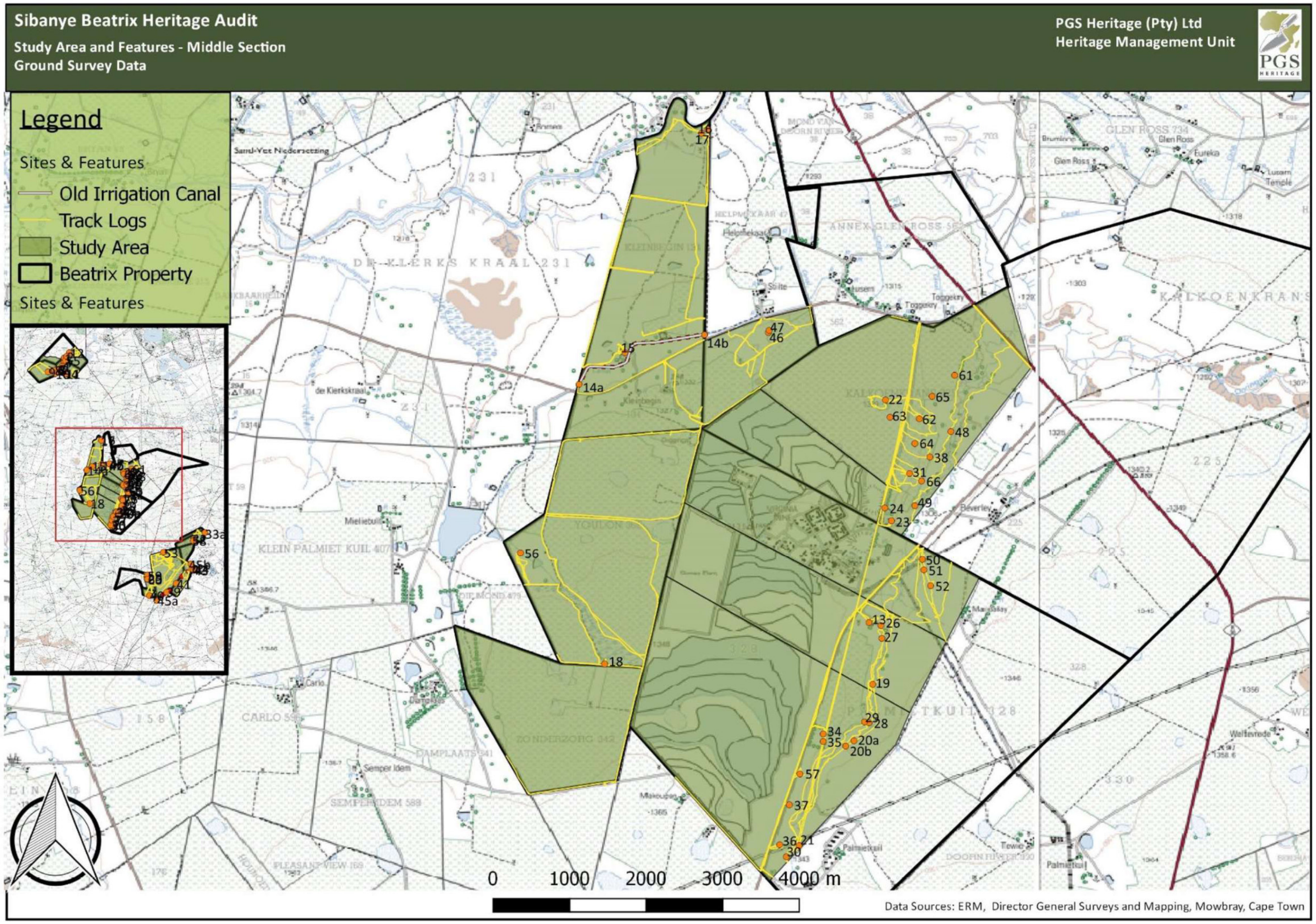
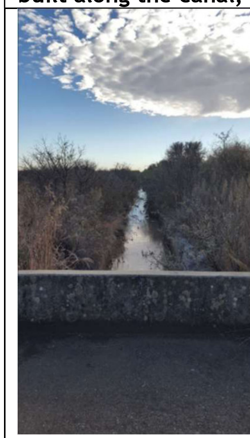


Figure 12-11: Map of the Beatrix 4 Shaft area, showing tracklogs (yellow) and heritage sites identified during the fieldwork (orange dots) (PSG, 2017)

Table 12-4: Heritage sites identified (PSG, 2017)

<table>
<tr><th>Site</th><th colspan="2">Figure</th></tr>
<tr><td rowspan="2">Site 014
This site contains the remains of a concrete irrigation canal that was likely built in the 1930s. The approximate length of the canal within the Sibanye Beatrix properties is 5.5km. The canal begins approximately 2.5km from the study area and runs through the study area and across several properties owned by Sibanye Beatrix. The canal runs through the Kleinbegin, Kalkoenkrans and Helpmekaar farms alongside a road. The canal is in a relatively good state of repair for most of its length and seems to have been well maintained; it may have been used until relatively recently. Several cattle crossings were built every 200m to 300m along its length. The canal made use of sluice gates that diverted water from the main canal into smaller channels that ran through the properties to irrigate the farmlands. The site possesses some levels of historic and architectural significance and represents a unique tangible remnant of historic farming activities in this area. The site has a GP. C /GP. B – Low to Medium Significance.</td><td>
Figure 12-12: One of the cattle crossings built along the canal, Site 014</td><td>
Figure 12-13: Sluice-gate at canal, Site 014</td></tr>
<tr><td>
Figure 12-14: View of a section of the irrigation canal with an associated smaller channel visible in the back</td><td></td></tr>
</table>

Site	Figure	
Site 018 The site is approximately 5m x 5m and comprises a brick reservoir with a trough around its base for watering livestock. It is constructed with good quality, baked red bricks which were characteristic of buildings in the 1930s. The imperial sizes of the bricks (in inches rather than centimetres) are also an indicator that the structure was built at least pre-1960s. It is of the same style as the reservoir at site 015e.The structure would rate as GP.C/GP.B – Low to Medium significance.	 **Figure 12-15: Red brick reservoir with trough, identified at Site 018. Scale is in 10cm increments**	
Site 019 The site is approximately 20 x10m.A low density surface scatter of Later Stone Age lithics was identified within the point bar of the meander of the Doorn River. The material found scattered over the surface had most likely been washed out from the soil close to the riverbanks (from fluvial processes and rain) over many years and is therefore in a secondary context. Raw material types recovered were those of Cryptocrystalline Silicates (CCS), Hornfels and Silcrete. Tool types recovered were a series of flakes and a CCS bladelet core. The site represents one of 12 known Stone Age sites from the entire study area. The site context is poor and as a result, the site has a GP. C – Low Significance.	 **Figure 12-16: Sample of Later Stone Age (LSA) materials observed on the surface of Site 019. Scale is in 1cm and 5cm increments**	 **Figure 12-17: Later Stone Age (LSA) bladelet core from Site 019. Scale is in increments of 1cm and 5cm**
Site 020 The site approximately is 100mx150mA relatively high density surface scatter of Later Stone Age (LSA) and Middle Stone Age (MSA) lithics was identified within the point bar of this meander of the Doorn River. The material found scattered over the surface had most likely been washed out from the soil close to the river banks (from fluvial processes and rain) over many years and is therefore in a secondary context. The LSA material consists of flakes and chunks made from Cryptocrystalline Silicates (CCS), Quartzite and Hornfels. The MSA material consists of blades and flakes manufactured from Hornfels and Quartzite. In excess of 50 lithics were observed over an area of approximately 150m x 100m.The site represents	 **Figure 12-18: General view of site 020**	 **Figure 12-19: Another general view of site 020**

Site	Figure	
one of 12 known Stone Age sites from the entire study area. The site has a GP. B – Medium Significance.	 **Figure 12-20: MSA lithics observed on the surface of the site. Scale is in increments of 1cm and 5cm**	 **Figure 12-21: LSA lithics observed on the surface of the site. Scale is in increments of 1cm and 5cm**
Site 022 The site approximately 50x50m.An extremely low density surface scatter of Later Stone Age lithics was identified here. These lithics were found around a grassy, overgrown pan situated within a ploughed field. The pan itself was too overgrown to be able to detect any surface materials. The material recovered is heavily out of context so does not hold much significance, however, the possibility exists for more material to be in the surrounding area. The site represents one of 12 known Stone Age sites from the entire study area. The site has a GP. C – Low Significance.	 **Figure 12-22: View of the pan at site 022**	 **Figure 12-23: View of the field around the pan at site 022, showing the dense grass cover**

Site	Figure	
Site 023 A concrete and brick foundation of an old farmhouse (approx. 20 square metres) and an outbuilding (approx. 10 square metres) were identified here. The remains of the walling on the farmhouse indicates that a brick-laying technique known as header bond was used in the construction of the building. This brick-laying technique results in 11-inch-thick internal walls and is typical of the period before the 1940s. The remains of linoleum flooring and earthenware piping also indicate that the structure was probably built in the 1930s. A possible midden was also identified in the area. The site is, likely, between 60 and 100 years old. As most of the structures have been demolished, the site has a rating of GP. C –Low Significance.	 **Figure 12-24: General view of the remains of the old farmhouse**	 **Figure 12-25: Example of linoleum flooring within the old farmhouse. Scale is in 10cm increments**
	 **Figure 12-26: The foundation remains of the outbuilding at site 023**	 **Figure 12-27: Fragments of earthenware piping. Scale is in 10cm increments**
Site 024 The site approximately 5x5m.This site consists of an old reservoir with an associated furrow located between several trees. It most likely supplied water to the farmhouse identified at site 023. The brick used in its construction was a baked red brick of imperial dimensions with large holes to facilitate the pouring of cement. This brick design was used before the 1940s.The site has a rating of GP. C – Low Significance.	 **Figure 12-28: View of the reservoir identified at Site 024. Scale is in 10cm increments**	 **Figure 12-29: Closer view of one of the bricks with which the reservoir was built**

Site	Figure	
Site 025 The remains of an old wagon shed were identified here. The structure is rectangular with two large entrances, allowing the easy entrance and exit of wagons. It was built out of stone and red brick, with sandstone cornerstones, a stone foundation and stone flooring. This structure is likely to be 100 years or older. A newer brick-based extension with a stone foundation was added to the structure at a later stage. Immediately adjacent to the wagon shed a plantation of trees is located that is likely older than 60 years. Although the structure is poorly preserved, t is certainly older than 100 years and represent one of the older historic structures identified during the fieldwork. As a result, the site is of GP. B – Medium Significance.	 **Figure 12-30: View of the wagon shed, Site 025. Scale is in 10cm increments**	 **Figure 12-31: View showing the brick foundation of the later extension to the wagon shed. Scale is in 10cm increments**
Site 026 This is the remains of a dry stone-packed wall found within dense vegetation and overgrowth. This stone wall is located in proximity to the historic farmstead at Site 013, approximately 5x2m in size,and was more than likely associated with it. As only the remains of the boundary wall has survived, the site has a rating of GP. C – Low Significance.	 **Figure 12-32: View of the stone-packed wall, Site 026. Scale is in 10cm increments**	 **Figure 12-33: Another view showing a tree growing through the wall**
Site 027 A low dry stone-packed wall was identified here. This wall runs alongside the flood banks of the Doorn River for some 50 metres. The wall is in a poor state of repair. This stone wall is in proximity to the historic farmstead at Site 013 and was more than likely associated with it. As only the remains of this wall have survived, the site has a rating of GP. C – Low Significance.	 **Figure 12-34: General view of dry stone wall, Site 027. Scale is in 10cm increments**	 **Figure 12-35: Side view of wall. Scale is in 10cm increments**

Site	Figure	
Site 028 The site approximately 20x20m. A low density surface scatter of Later Stone Age (LSA) lithics is located here. Only some 10 lithics were recovered over a 400m2 area. These lithics consisted of flakes and CCS and Quartz. The site represents one of 12 known Stone Age sites from the entire study area. The low density character of the site means that it has a GP. C – Low Significance.	 **Figure 12-36: View of LSA waste material, Site 028. Scale is in increments of 1cm and 5cm**	
Site 029 The site comprises a high density Later Stone Age (LSA) surface scatter with a smaller number of MSA flakes also observed. The site is primarily located on the land mass between the river and a non-perineal tributary and is fairly undisturbed. The finds are concentrated on this land mass between the river and a non-perennial stream, but pieces were recovered from the inner bank of the main river and the inner bank of the non-perineal tributary. LSA flakes, cores, chunks and a possible scraper made from Cryptocrystalline Silicates (CCS) and a few MSA flakes made from Hornfels were recovered. Some formal lithics appear to be present. Roughly 60 lithics were observed over an area of approximately 2,000m2. The site extends for some distance and continues beyond the boundary of the study area. The site represents one of 12 known Stone Age sites from the entire study area. The relatively high density of the site as well as its relatively undisturbed character, mean that the site has a GP. B – Medium Significance.	 **Figure 12-37: Sample of LSA waste materials at Site 029. Scale is in increments of 1cm and 5cm**	 **Figure 12-38: Sample of MSA waste materials. Scale is in increments of 1cm and 5cm**

Site	Figure	
	 Figure 12-39: The cement headstone on the grave of Kornelius Mohlakoana (1887 – 1967). Scale in 10cm increments	 Figure 12-40: The sandstone headstone on the grave of Anna Matlebe (12 May 1906). This grave appears to be one of the oldest graves from the cemetery. Scale in 10cm increments
Site 032 The site is approximately 20x10m. No structures or structural materials are visible at the site. However, two areas of hard-packed dirt without any vegetation growth, likely represent the floors of the huts. A midden was identified in the area between the two possible hut floors. It must be noted that in terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Until the presence of such possible graves at the site has been proven or disproven, a worst-case scenario will be adopted within which it is assumed that such stillborn baby graves are indeed located here. Until such time that the presence of graves at the site has been tested, the site must be viewed as containing stillborn graves. Graves and burial grounds have high levels of emotional, religious and historical significance. As a result, the site has a GP. A – Medium to High Significance.	 Figure 12-41: General view of Site 032	 Figure 12-42: View of the midden at Site 032

<table>
<tr><th>Site</th><th colspan="2">Figure</th></tr>
<tr><td rowspan="2">Site 034
The site was recorded during the fieldwork process in the same proximal area where Site Feature 14 was shown to be located during the desktop study. This desktop study feature is depicted as two buildings on an early topographic map sheet surveyed during the 1940s.The site consists of the remains of a southwest facing, small building (8x8m) which is surrounded by an extensive
Bluegum tree windbreak (6 000 m^2). The building has baked clay brick walls with concrete lintels, a concrete foundation and steel door frames. It may have been a garage with attached storage areas. In addition to this main structure, the site contains the remains of several other structures:
A brick reservoir with a diameter of approximately 10m.
An old, corrugated reservoir situated north-west of the brick reservoir, which had been used as a relatively
recent midden containing a large amount of beer bottles and cans dating to the 1960s/1970s.
Two boreholes and a windmill situated north-east of the brick dam. The site size is approximately 300x200m.
Due to the very dilapidated state of the structures, the site is rated GP.C – Low Significance.</td>
<td>
Figure 12-43: Front view of the building at Site 034. The concrete lintels are visible</td>
<td>
Figure 12-44: Rear view of the same building. The steel doorframes can be seen</td></tr>
<tr><td>
Figure 12-45: Remains of old brick reservoir at Site 034</td>
<td>
Figure 12-46: Remains of old corrugated reservoir.</td></tr>
</table>

Site	Figure	
Site 035 This site is located just outside the same Bluegum wind break from Site 034 and is, likely, the remains of labourers' accommodation associated with Site 034. An upright stone fence post as well as two rectangular stone foundations (6x3m and 8x3m) were identified here. It must be noted that in terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Until the presence of such possible graves at the site has been proven or disproven, a worst-case scenario will be adopted within which it is assumed that such stillborn baby graves are indeed located here. Until such time that the presence of graves at the site has been tested, the site must be viewed as containing stillborn graves. Graves and burial grounds have high levels of emotional, religious and historical significance. As a result, the site has a GP. A – Medium to High Significance	 **Figure 12-47: Upright stone fence post at Site 35. Scale is in increments of 10cm**	 **Figure 12-48: Visible remains of stone foundation of the 8x3m structure. Scale is in increments of 10cm**
Site 036 The remains identified in the field consist of a 3x12m dressed, packed-stone foundation. Although the exact age of the structure is not known, it is certainly older than 60 years. A nearby electricity pylon may have disturbed sections of the site. It must be noted that in terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Until the presence of such possible graves at the site has been proven or disproven, a worst-case scenario will be adopted within which it is assumed that such stillborn baby graves are indeed located here. Until such time that the presence of graves here has been tested, the site must be viewed as containing stillborn graves. These sites have high levels of significance. As a result, the site is of GP. A – Medium to High Significance.	 **Figure 12-49: General view of the Site 036, showing the Eskom pylon. Scale is in increments of 10cm**	 **Figure 12-50: Visible remains of structure foundation. Scale is in increments of 10 cm**

Site	Figure	
Site 037 The remains of the site identified in the field consist of a stone and mud wall which is approximately 40cm long. Although the exact age of the structure is not known, it is certainly older than 60 years. It must be noted that in terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Until the presence of such possible graves at the site has been proven or disproven, a worst-case scenario will be adopted within which it is assumed that such stillborn baby graves are indeed located here. Until such time that the presence of graves at the site has been tested, the site must be viewed as containing stillborn graves. Graves and burial grounds have high levels of emotional, religious and historical significance. As a result, the site has a GP. A – Medium to High Significance	 **Figure 12-51: The remains of the stone and mud wall at Site 037**	
Site 038 Approximately 10mx10m.The site consists of a low density Later Stone Age scatter. Approximately 10 lithics were identified here over an area roughly 10m2 in extent. The site represents one of 12 known Stone Age sites from the entire study area. The secondary context of the material observed at the site as well as its low density site mean that the site has a GP. C – Low Significance	 **Figure 12-52: LSA lithics observed at Site 038. Scale is in 10cm increments**	

Site	Figure	
	 **Figure 12-53: The poorly preserved remains of the milking shed at Site 044. Scale in 10cm increments**	 **Figure 12-54: The gable-roofed storeroom in proximity to the livestock enclosures at Site 044. Scale in 10cm increments**
Site 046 The site comprises a cemetery with approximately 30-40 graves, all aligned east-west. One of the graves is fenced off and another has a welded metal railing around it. Most of the graves have rectangular brick dressings and metal plaques. One of the graves is an oval stone-packed grave with an old bicycle frame placed on top of the dressing. From the inscribed headstones, it is evident that the graves from this cemetery include the deceased of the Ramalefane, Mutale and Makhoro families. The site appears to have been a farmworker cemetery. All graves have high levels of emotional, religious and in some cases historical significance. The site significance is GP. A - Medium to High Significance.	 **Figure 12-55: General view of some of the graves from the cemetery at Site 046**	 **Figure 12-56: Another general view of some of the graves from the cemetery at Site 046**

Site	Figure	
Site 047 Approximately 40x20m.The site comprises a cemetery with approximately 20 graves. Several of the graves have rectangular brick dressings and metal plaques, other comprise large sand mounds, with metal plaques and grave goods. From the inscribed headstones, it is evident that the graves from this cemetery include the deceased of the Zwane, Mphuthi, Moleko and Ramalefane families. The site appears to have been a farmworker cemetery. All graves have high levels of emotional, religious and in some cases historical significance. The site significance is GP. A - Medium to High Significance.	 **Figure 12-57: General view of some of the graves from the cemetery at site 047**	 **Figure 12-58: One of the graves from the cemetery at site 047**
Site 048 The site is located on the western bank of the Boschluis Spruit in an extensively eroded area marked by various depressions and dongas. It comprises a reasonably high density scatter of Middle and Later Stone Age lithics exposed by erosion activities. The highest density of lithics identified at the site was estimated to be 15 lithics per m2, approximately 70m x 60m..The site represents one of 12 known Stone Age sites from the entire study area. The relatively high density of lithics identified at the site increases its significance. As a result, the site has a GP. A – Medium Significance.	 **Figure 12-59: General view along the western bank of the Boschluis Spruit where Site 048 was identified.**	 **Figure 12-60: Sample of lithics observed on the surface of the site. Scale is in 1cm and 5cm increments.**

Site	Figure	
Site 049 The site represents one of 12 known Stone Age sites from the entire study area. The site has a GP. B – Medium Significance.	 **Figure 12-61: General view of the site 049**	 **Figure 12-62: Sample of lithics observed on the surface of the site. Scale is in 1cm and 5cm increments**
Site 050 The site comprises the poorly preserved remains of farm worker accommodation on the farm Palmietkuil 328. All that remains of the farm worker accommodation at this site are two rectangular stone foundations (050a & 050b) associated with cultural material in the form of glass and metal fragments. A concentration of cultural material in the form of a midden (050c) is also located nearby. Until such time that the presence of graves at the site has been tested, the site must be viewed as containing stillborn graves. The exact age of the site is not known. However, the only time that huts are depicted in proximity to this site on the available topographical map sheets, is on the Second Edition of the 2826BA sheet that was surveyed in 1954. It likely therefore for the site to be potentially just older than 60 years. Furthermore, the presence of a Consol glass item provides a	 **Figure 12-63: General view of the structure at Site 050a. Scale is in 10cm increments**	 **Figure 12-64: Three of the glass fragments observed in proximity to Site 050a. Scale is in 1cm increments**

Site	Figure	
terminus post quem for this section of the midden in that Consolidated Glass Works was started in May 1946 Graves and burial grounds have high levels of significance. As a result, the site has a GP. A – Medium to High Significance. The structural remains have a relatively low significance with the cultural material of low significance.	 **Figure 12-65: General view of the structure at Site 050b. Scale is in 10cm increments**	 **Figure 12-66: The midden identified at Site 051c. Scale is in 10cm increments**
Site 051 The site comprises the poorly preserved remains of farm worker accommodation on the farm Palmietkuil 328. All that remains of the farm worker accommodation is a rectangular stone foundation (5m x 3m) and four stone corner posts of a small camp (5m x 5m), possibly for the keeping of livestock. Cultural material in the form of glass, metal and imported ceramic fragments were identified in association with the rectangular foundation structure. Only on of the stone posts are still in an upright position, with another one leaning over and the remaining two posts lying flat on the ground. The exact age of the site is not known. However, the only time that huts are depicted in proximity to this site on the available topographical map sheets, is on the Second Edition of the 2826BA sheet that was surveyed in 1954. It seems likely therefore for the site to be potentially just older than 60 years. The site may be just older than 60 years with some remnants of its stone structures remaining. The cultural material identified here is not older than 100 years and as a result not protected by the available heritage legislation. It must be noted that in terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Until the presence of such possible graves at the site has been proven or disproven, a worst-case scenario will be adopted within which it is assumed that such stillborn baby graves are indeed located here. Until such time that the presence of graves at the site has been tested, the site must be viewed as containing stillborn graves. Graves and burial	 **Figure 12-67: View of the remnants of what seems to have been a livestock camp at Site 051. Apart from the upright corner post visible in the front, the positions of the other corner posts are marked. Scale in 10cm increments**	 **Figure 12-68: General view of the remains of the structure at Site 051. Scale is in 10cm increments**

Site	Figure	
grounds have high levels of emotional, religious and historical significance. As a result, the site has a GP. A – Medium to High Significance. The structural remains have a relatively low significance with the cultural material identified at the site of low significance.		
Site 052 The site is approximately 120m x 70m and comprises the poorly preserved remains of farm worker accommodation on the farm Palmietkuil 328. All that remains are scatters of cultural material such as glass and metal fragments. The exact age of the site is not known. However, the only time that huts are depicted in proximity to this site on the available topographical map sheets, is on the Second Edition of the 2826BA sheet that was surveyed in 1954. It seems likely therefore for the site to be potentially just older than 60 years. This said, none of the structures have remained preserved. Furthermore, the cultural material identified here is not older than 100 years. It must be noted that in terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Until the presence of such possible graves at the site has been proven or disproven, a worst-case scenario will be adopted within which it is assumed that such stillborn baby graves are indeed located here. Until such time that the presence of graves at the site has been tested, the site must be viewed as containing stillborn graves. Graves and burial grounds have high levels of emotional, religious and historical significance. As a result, the site has a GP. A – Medium to High Significance. The cultural material identified at the site is of low significance.	 **Figure 12-69: View of the remnants of what seems to have been a livestock camp at Site 051. Apart from the upright corner post visible in the front, the positions of the other corner posts are marked. Scale in 10cm increments**	 **Figure 12-70: : General view of the remains of the structure at Site 051. Scale is in 10cm increments**
Site 052 The site is approximately 120m x 70m and comprises the poorly preserved remains of farm worker accommodation on the farm Palmietkuil 328. All that remains are scatters of cultural material such as glass and metal fragments. The exact age of the site is not known. However, the only time that huts are depicted in proximity to this site on the available topographical map sheets, is on the Second Edition of the 2826BA sheet that was surveyed in 1954. It seems likely therefore for the site to be potentially just older than 60 years. This said, none of the structures have remained preserved. Furthermore, the cultural material identified here is not older than 100 years. It must be noted that in terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Until the presence of such possible graves at the site has been proven or disproven, a worst-case scenario will be adopted within which it is assumed that such stillborn baby graves are indeed located here. Until such time that the presence of graves at the site has been tested, the site must be viewed as	 **Figure 12-71: General view of the Site 052. Scale is in 10cm increments**	 **Figure 12-72: Cultural material in the form of glass and metal fragments is found**

Site	Figure	
containing stillborn graves. Graves and burial grounds have high levels of emotional, religious and historical significance. As a result, the site has a GP. A – Medium to High Significance. The cultural material identified at the site is of low significance		**across the surface of the site. Scale is in 10cm increments**
Site 053 All graves have high levels of emotional, religious and in some cases historical significance. The site significance is GP.A - Medium to High Significance.	 **Figure 12-73: General view of the cemetery at Site 053**	 **Figure 12-74: The headstone on the grave of Jacob L. Lebethe (1909 - February 197(?)3) from Site 053**

<u>Site 054 to Site 066</u>

The following sites (Site 054 to Site 066) are marked on the historic topographic map as a hut. However, the site were not visited during the fieldwork survey, as it was not initially included in the study area. Due to the risk of unmarked stillborn graves, it is included in the inventory. It is clear from satellite imagery that there will be no surface remains as the site lays in an agricultural field and has been heavily ploughed. However, it must be noted that in terms of black African tradition, stillborn babies were often buried in unmarked graves underneath or adjacent to the homesteads of their parents. Until the presence of such possible graves at the site has been proven or disproven, a worst-case scenario will be adopted within which it is assumed that such stillborn baby graves are indeed located here. Until such time that the presence of graves at the site has been tested, the site must be viewed as containing stillborn graves. Graves and burial grounds have high levels of emotional, religious and historical significance. As a result, the site has a GP. A – Medium to High Significance.

12.13 Socio-economic

The information in this section has been derived from the Social and Labour Plan 2022-2026 compiled by Sibanye-Stillwater, (Sibanye-Stillwater, 2025).

12.13.1 Historic and Geographic Overview

The Free State is South Africa's third-largest province, covering 129 825 km². Despite its size, it has the second-smallest population (2 834 714 people) and the second-lowest population density. It is home to 5.1% of the national population. Predominantly rural, the province is characterised by farmland, mountains, goldfields, and dispersed towns. It shares borders with the Northern Cape, Eastern Cape, North West, Mpumalanga, KwaZulu-Natal, and Gauteng provinces, as well as Lesotho.

Agriculture, mining, and manufacturing are the dominant sectors of the Free State economy. Approximately 90% of the province is cultivated for crop production. The province contributes significantly to South Africa's food basket, producing 34% of the country's maize, 37% of its wheat, 53% of its sorghum, 33% of its potatoes, 18% of its red meat, 30% of its groundnuts, and 15% of its wool. The Free State is also one of the world's top five gold producers and leads the country's chemicals industry, being home to Sasol, the multinational synthetic-fuels producer.

Local government in the Free State is organised into five major municipalities: one metropolitan municipality (Mangaung) and four district municipalities—Xhariep, Lejweleputswa, Thabo Mofutsanyane, and Fezile Dabi. Within these districts, there are 18 local municipalities. Lejweleputswa District, which is rich in gold deposits, provides a key spatial overview of the province. Sibanye-Stillwater's operations are located in the Masilonyana Local Municipality and the Matjhabeng Local Municipality, both within the Lejweleputswa District Municipality.

Table 12-5: Key Spatial Data, 2018 (Community Survey 2016)

	South Africa	Free State	District Municipalities				
			Lejwele-putswa	Fezile Dabi	Thabo Mofutsanyana	Xhariep	Mangaung
Size of the Area (km²)	1 229 341,50	1 300 011,50	32168	20829	33516,8	37930	9899,1
%Share of the Region	N/A	10,58%	24.74%	16%	26%	29%	8%

Lejweleputswa District is the third most populous of the five Free State districts. It is a Category C municipality located in the north-western part of the province. The district comprises five local municipalities—Masilonyana, Tokologo, Tswelopele, Matjhabeng, and Nala—with approximately 18 towns distributed throughout. Table 12-6 presents the main socio-economic characteristics of Lejweleputswa in comparison to those of the province and South Africa as a whole (Sibanye-Stillwater, 2025).

Table 12-6: Key Socio-economic Indicators (Sibanye-Stillwater, 2025)

Indicator	Unit/Variable	SA	Free State	Lejweleputswa District
Demographic	Total population	55563654	2834714	649964
	% Share of Region		5.1%	22%
	Population density (number of people per) (2018)	45.3	21.8	20.1
	Urban Population Growth Rate (%) (2016 - 2020)	1.6	0.7	0.2
Development	Human Development Index (HDI)	0.709	0.708	0.62
	Gini coefficient (2019)	0.64	31.8	28.5%
	Poverty gap rate (from upper poverty line)	55.5	23.4	30.9
	Number with Matric age 20+ years	11 964 348	544.168	114 454
	% With Matric of age 20+ years population	35.4%	19.1	18.03%
	Share of household occupying formal dwellings (2017)	87.1%	83.6	83.2%

Masilonyana, a Category B municipality covering 6 618 km², lies between the province's largest municipality, Mangaung Metro, to the south, and the second-largest, Matjhabeng, to the north. The towns of Theunissen, Brandfort, Winburg, Soutpan, and Verkeerdevlei—formerly Transitional Local Councils—were amalgamated into this municipality. The area is notable for its game reserves and tourism attractions, including the Florisbad National Quaternary Research Station. Soutpan, within Masilonyana, is well known for its commercially exploited salt lakes.

Matjhabeng, also a Category B municipality, spans 5 690 km² and is bordered by Nala to the north, Masilonyana to the south, Tswelopele to the east, and Moqhaka to the west. It is recognised as a major hub of mining activity.

Figure 12-75: Local Municipalities within Lejweleputswa District (Sibanye-Stillwater, 2025)

12.13.2 Economic Sectors

Mining, construction, transport, electricity, and trade are the major economic sectors in Lejweleputswa District, with mining being the dominant contributor. However, the district economy has experienced a prolonged recession from 2015 to 2018, highlighting significant economic challenges.

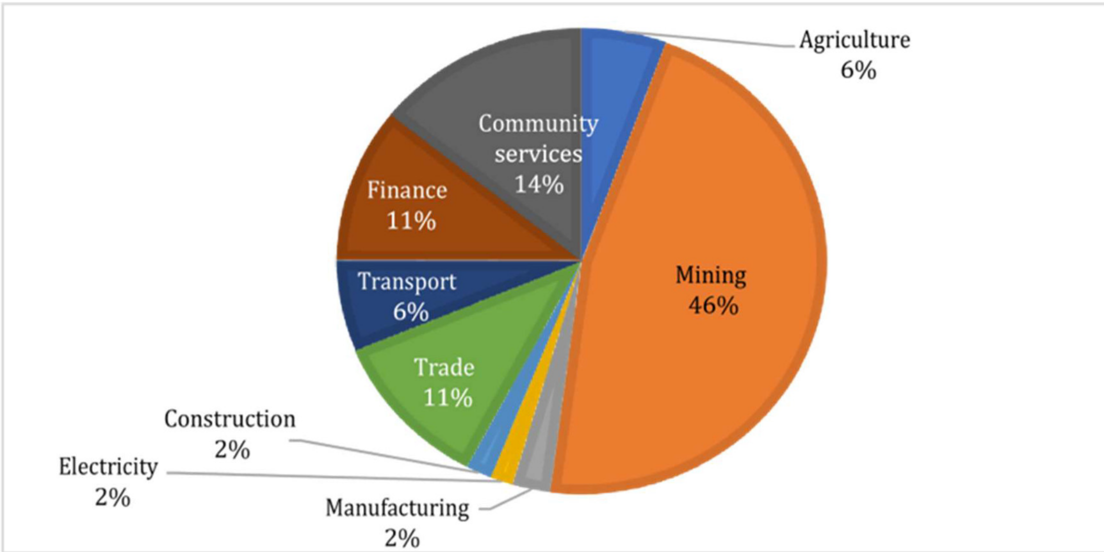


Figure 12-76: Percentage contribution of each sector to the Lejweleputswa District Municipality Economy (IDP 2020 – 2021)

12.13.3 Social Development Perspective

Masilonyana and Matjhabeng municipalities have populations of 62 770 and 429 113 respectively (StatsSA, 2016). Table 12-7 provides an overview of their demographic profiles. Masilonyana's population has grown by 1.07%, while Matjhabeng's population has increased by 1.2% over five years. Most residents in both municipalities fall within the working-age population (15–64 years).

The Free State is characterised by a "demographic dividend"—the economic growth potential that arises when the share of the working-age population is larger than the non-working-age population. However, this advantage can only be realised if children and youth are properly educated and equipped with relevant skills aligned to the province's economic needs.

Table 12-7: Demographic Information (Community Survey 2016)

	Masilonyana		**Matjhabeng**	
Demographic	**2016**	**2011**	**2016**	**2011**
Population	62 770	59 895	429 113	407 020
Age Structure				
Population under 15	28%	29.7%	25%	27,30%
Population 15 to 64	66.7%	64.59%	70.2%	68.%
Population over 65	5.4%	5.8%	4.8%	4.7%
Population Growth				
Per Annum	1.07%	n/a	1.2%	n/a

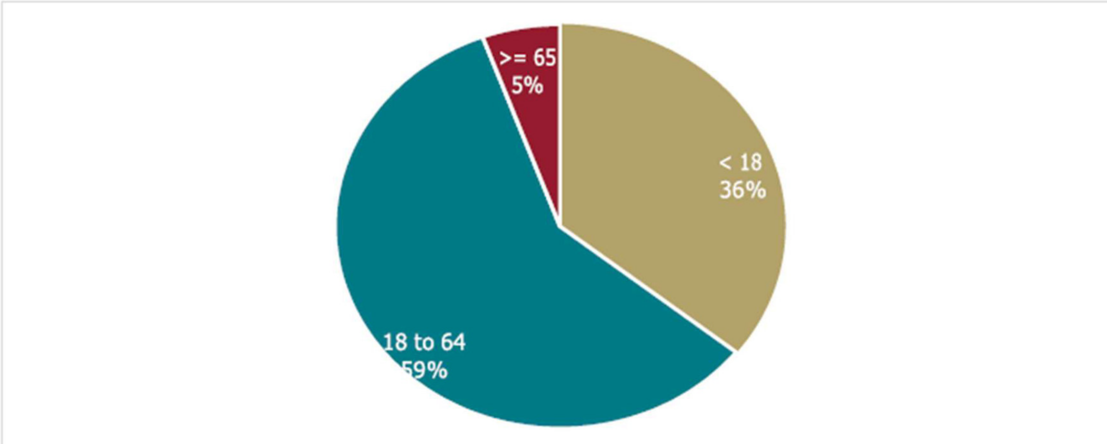


Figure 12-77: Free State Province Population by 3 Main Age Groups (Community Survey 2016)

An analysis of households shows that nearly 70% are male-headed in both municipalities.

Table 12-8: Distribution of Household Head by Gender (Community Survey 2016)

	Masilonyana		Matjhabeng	
Gender	**Number**	**Percentage**	**Number**	**Percentage**
Female	8 536	39.6%	58,685	39.3%
Male	13 022	60.4%	90,481	60.7%
Total	21 558	100%	149 166	100%

12.13.4 Origin of population and migration

According to the data presented in Figure 12-78, the majority of Free State residents are born within the province, with 90% of the population indicating local birth. This suggests relatively low migration trends and highlights that the Free State is not a significant destination for immigrants. Contributions from other South African provinces and foreign-born residents each account for less than 2% of the population.

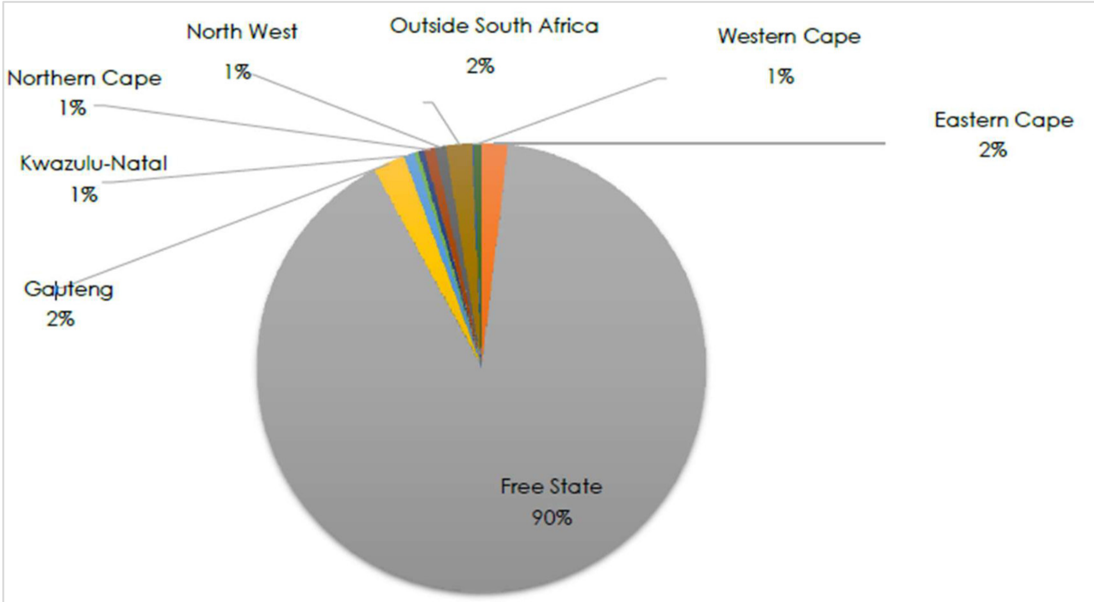


Figure 12-78: Place of Birth/Area of Origin of Residents (Community Survey 2016)

An analysis of Masilonyana and Matjhabeng confirms this provincial trend. In Masilonyana, 98.5% of residents were born in South Africa, while in Matjhabeng the figure is 96.3%. The majority were born in the Free State itself, with 93.3% in Masilonyana and 86.2% in Matjhabeng reporting local birth. Notably, Matjhabeng shows a stronger migratory influence from the neighbouring Eastern Cape, which contributes 5.1% to its population—a deviation from the provincial pattern.

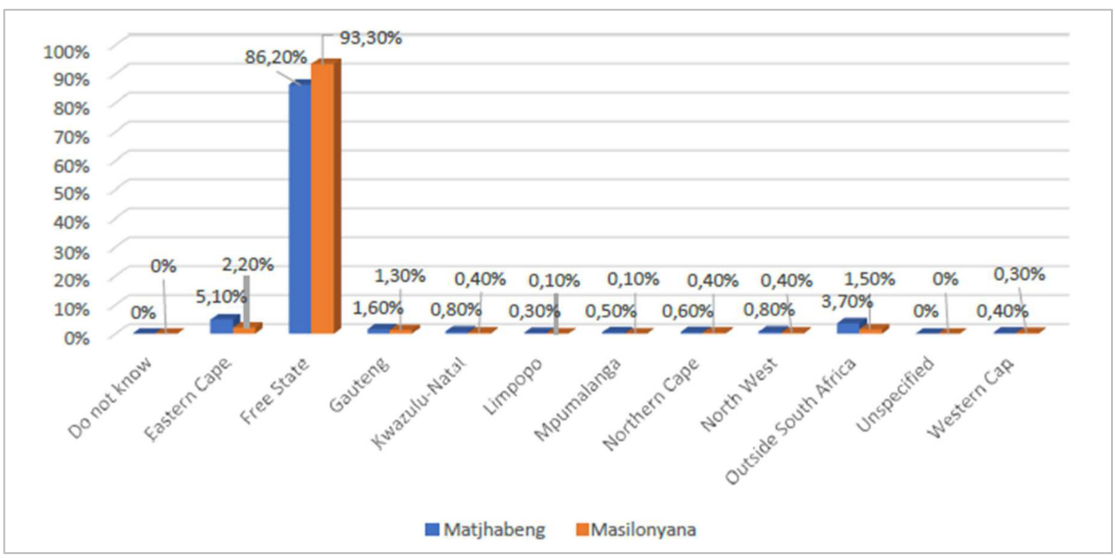


Figure 12-79: Place of Birth/Area of Origin of Residents in Masilonyana and Matjhabeng (Community Survey 2016)

12.13.5 Education

Table 12-9 provides an overview of the highest education levels attained by residents of Masilonyana and Matjhabeng, compared with the Lejweleputswa District, the Free State, and South Africa as a whole.

Approximately one in three residents in both Masilonyana and Matjhabeng have completed matric, while a similar proportion have some secondary schooling but did not matriculate. Post-secondary qualifications are relatively limited, with certificates and diplomas being the most common (4.5% in Masilonyana and 4.1% in Matjhabeng). The percentage of degree holders in both municipalities is below 4%, slightly lower than provincial and national averages.

The proportion of residents with no schooling in Masilonyana (7.2%) is double that of Matjhabeng (3.7%), suggesting a notable disparity in access to basic education between the two municipalities.

Table 12-9: Population (Over 20 and older) by Highest Education Level in Masilonyana and Matjhabeng (Community Survey 2016)

Level of Education	Masilonyana (%)	Matjhabeng (%)	Lejweleputswa (%)	Free State (%)	South Africa (%)
No schooling and not sure	7.2	3.7	5.7	7.2	8.7
Primary level schooling	16.9	15.2	18	16.9	13.2
Secondary level schooling but with no Matric	38.8	38.8	38	34.4	33.1
Matric	30.8	33.3	30	30.5	32.6
Post matric certificate and diploma	4.5	4.1	3.8	4.5	5.3
Bachelor's degree	3.7	3.1	2.94.4	4.4	4.3
Honours degree	0.9	0.9	0.8	0.9	1.3
Masters degree	0.3	0.1	0.1	0.3	0.4
Postgraduate certificate/diploma	0.7	0.7	0.6	0.7	0.9
PhD	0.2	0.1	0.1	0.2	0.2

12.13.6 Service Delivery

Dwelling Type

Quality and affordable housing, supported by adequate social facilities and access to employment, is a key indicator of sustainable community development. An analysis of dwelling types in Masilonyana and Matjhabeng shows that the majority of households—84% in Masilonyana and 86.2% in Matjhabeng—live in conventional formal housing.

Table 12-10: Distribution of households by Type of Main Dwelling in Masilonyana and Matjhabeng (Community Survey 2016)

Housing Typology	Matjhabeng (%)	Masilonyana (%)	Lejweleputswa (%)	Free State (%)	South Africa (%)
Caravan/tent	0	0	0	0	0
Cluster house in complex	0.1	0	0.1	0.3	0.3
Cluster house in complex of flats	2	0.6	1.5	1.7	3.5
House/flat/room in backyard	4.6	6.5	4.6	5.9	65.9
House or brick/concrete block structure on a separate plot	76.9	74.6	76.2	74.4	65.9

Housing Typology	Matjhabeng (%)	Masilonyana (%)	Lejweleputswa (%)	Free State (%)	South Africa (%)
Informal dwelling (shack; in backyard)	6.3	4.6	5.9	6	5.4
Informal dwelling (shack; not in backyard)	8.4	11	9.8	8	7.5
Room/flatlet on a property or larger dwelling/servants quarter/granny flat	0.3	0.9	0.3	0.4	0.8
Semi-detached house	0.3	0.8	0.3	0.3	0.8
Townhouse (semi-detached house in a complex)	0.3	0.6	0.3	0.7	0.8
Dwelling/hut/ structure made of traditional materials	0.3	0.2	0.5	1.6	7
Other	0.5	0.2	0.5	0.7	0.8

Home ownership levels are relatively high: 60.2% of Masilonyana residents and 61.6% of Matjhabeng residents own fully paid-off houses. A further 8.1% in Masilonyana and 9.8% in Matjhabeng are in the process of acquiring ownership. Rental accommodation is limited, reflecting a strong correlation between place of origin and investment in long term housing. However, around 15% of households in both municipalities continue to reside in informal settlements, highlighting the need for improved housing provision.

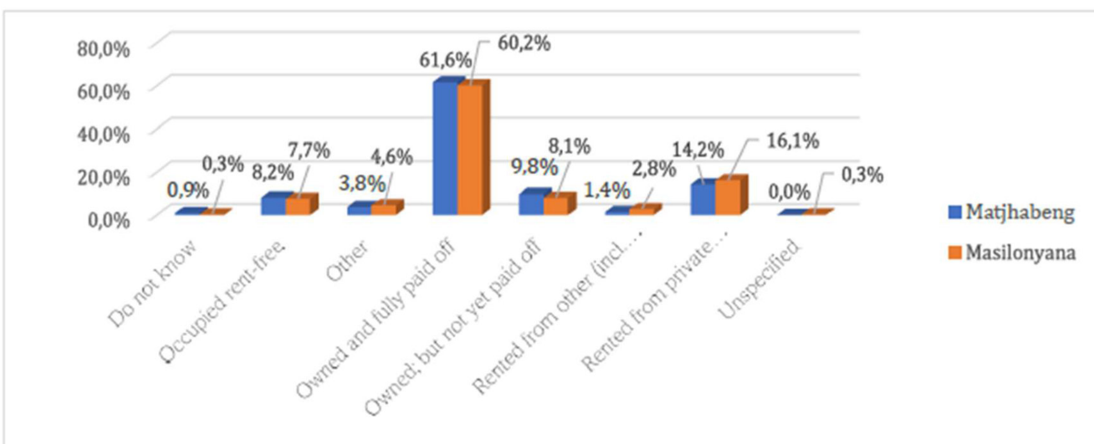


Figure 12-80: Housing by Ownership in Masilonyana and Matjhabeng (Community Survey 2016)

Water

Access to piped water is generally adequate but varies in distribution. In Masilonyana, 65.6% of households have access inside their dwellings and 28.8% within their plots. By contrast, Matjhabeng has invested in water infrastructure within residential plots, with only 40.3% of households having water inside their homes and 54.4% accessing it within their plots.

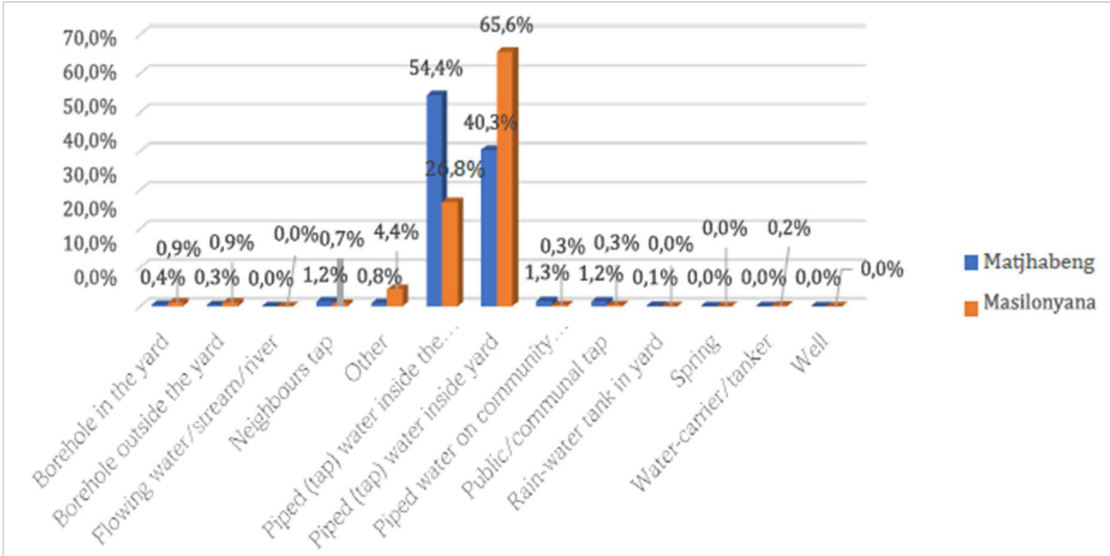


Figure 12-81: Population by Water Source (Community Survey 2016)

Despite these differences, municipal provision is the dominant source of water supply, serving 97.5% of households in Masilonyana and 93.2% in Matjhabeng. Nonetheless, nearly 2% of households in both municipalities still rely on alternative sources.

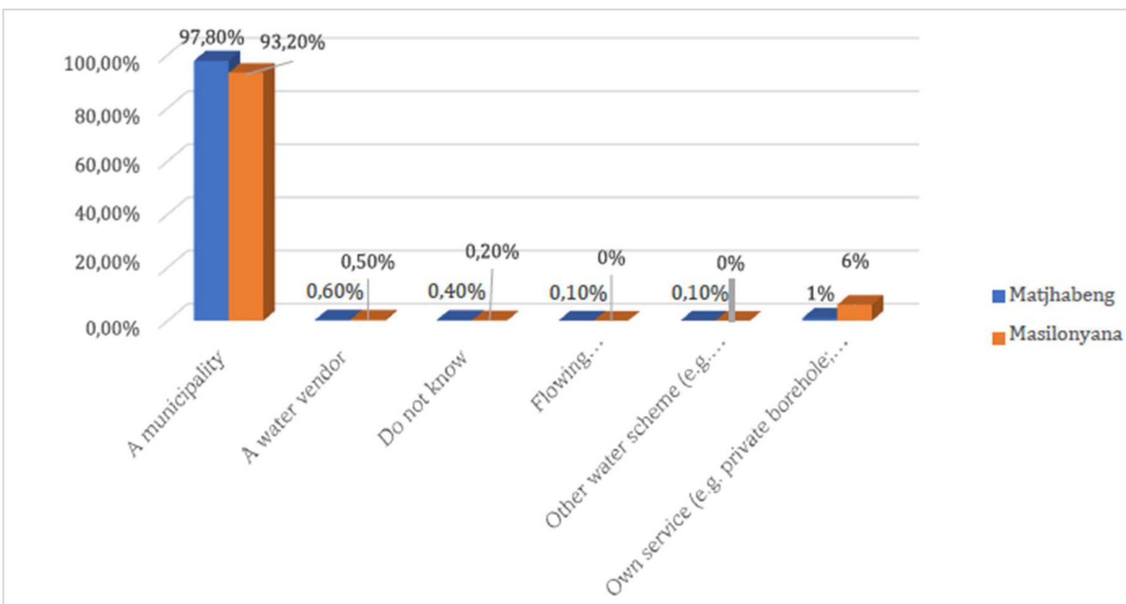


Figure 12-82: Population by Water Supplier (Community Survey 2016)

Energy

Electricity access is relatively high in both municipalities. Most households use prepaid or conventional metres, although 3% of Matjhabeng and 5.5% of Masilonyana residents have no access to conventional electricity. Renewable energy use is negligible, with fewer than 0.5% of households using solar or wind-generated power.

Table 12-11: Distribution of households by Type of Main Dwelling in Masilonyana and Matjhabeng (Community Survey 2016)

Type of Energy Source	Matjhabeng		Masilonyana	
	Population	Percentage (%)	Population	Percentage (%)
Battery	456	0	89	0.10
Connected to other source which household is not paying for	5429	0.1	153	0.2
Connected to other source which household pays for	160	1.3	818	1.3
Generator	70483	0	0	0
In-house conventional metre	338377	16.4	7356	11.7
In-house prepaid metre	13007	78.9	50682	80.7
No access to electricity	764	3	3461	5.5
Other	764	0.2	212	0.3
Solar home system	252	0.1	0	0

Sanitation

Adequate sanitation remains a challenge. In Masilonyana, 7.4% of households rely on the bucket system, compared to 3.1% in Matjhabeng. Alarmingly, 1.3% of households in Masilonyana and 2.2% in Matjhabeng have no toilet facilities at all. The majority of households, however, use flush toilets connected to municipal sewerage systems.

Table 12-12: Distribution of Households by Type of Toilet Facility (Community Survey 2016)

Type of Toilet Facility	Matjhabeng		Masilonyana	
	Population	Percentage (%)	Population	Percentage (%)
Bucket toilet (collected by municipality)	6 765	1.6	3753	6
Bucket toilet (emptied by household)	6 606	1.5	905	1.4
Chemical toilet	439	0.1	281	0.4
Ecological toilet (e.g. urine diversion; enviro loo)	55	0	145	0.2
Flush toilet connected to a public sewerage system	368596	85.9	5395	84
Flush toilet connected to a septic tank or conservancy tank	1172	0.3	492	0.8
Pit latrine/toilet without ventilation pipe	28638	6.7	841	1.3
Pit latrine/toilet with ventilation pipe	1036	0.2	462	0.7
Other	115	2.7	545	0.9
None	4307	1	1395	2.2

Refuse Removal

Effective waste management is essential for protecting both communities and the environment. In both municipalities, refuse removal is primarily managed by local authorities, with 78.5% of households in Masilonyana and 82.2% in Matjhabeng benefiting from organised collection services.

Nevertheless, challenges persist: 16.8% of Masilonyana households and 8.4% of Matjhabeng households rely on private refuse dumps, while 3.4% of Matjhabeng households still dispose of waste illegally. This is a particular concern given the ES of wetlands in the Free State.

Table 12-13: Percentage Distribution of Households by Refuse Removal (Community Survey 2016)

Type of Toilet Facility	Matjhabeng		Masilonyana	
	Population	Percentage (%)	Population	Percentage (%)
Communal container/central collection point	404	0.9	0	0
Communal refuse dump	2011	4.7	1293	2.1
Dump or leave rubbish anywhere (no rubbish disposal)	14804	3.4	702	1.1
Own refuse dump	35943	8.4	10547	16.8
Removed by local authority/private company/community members at least once a week)	31734	74	41819	66.6
Removed by local authority/private company/community members less often than once a week	35105	8.2	8096	12.9
Other	1771	0.4	313	0.5

<u>Internet Access</u>

Internet access, a key driver of socio-economic development in the era of the Fourth Industrial Revolution (4IR), remains very limited. Only 10% of households in Masilonyana and 7% in Matjhabeng report having access.

This digital divide reflects significant socio-economic inequality. The Covid-19 pandemic highlighted the importance of internet connectivity for education, information sharing, and economic activity. Yet, more than 90% of households in both municipalities remain excluded from reliable online access, cutting them off from important educational, commercial, and social opportunities.

Table 12-14: Access to the Internet (in percentage terms) (Community Survey 2016)

Gender of household head	Masilonyana	Matjhabeng
Female	11%	8%
Male	9%	6%
Total	10%	7%

12.13.7 Food Security and Agricultural Activities

Agriculture plays an important role in sustaining livelihoods in Masilonyana and Matjhabeng. In Masilonyana, crop production is the most common agricultural activity, while in Matjhabeng approximately 35% of households are involved in vegetable production.

Table 12-15: Households involved in agricultural activities in Masilonyana and Matjhabeng (Community Survey 2016)

Type of Agricultural Activity	Lejweleputwa		Masilonyana		Matjhabeng	
	Number	Percentage	Number	Percentage	Number	Percentage
Livestock production	7 330	18	1119	19	2984	13
Poultry production	8947	22	1074	18	4240	18
Production of other crops	10 090	24	1796	31	4703	20
Vegetable production	11 854	28	1255	21	8066	35
Other	3 162	8	656	11	3022	13

Type of Agricultural Activity	Lejweleputwa		Masilonyana		Matjhabeng	
	Number	Percentage	Number	Percentage	Number	Percentage
Total	41 383	1000	5869	100	23015	19

Despite relatively high engagement in agricultural activities, food insecurity remains a significant socio-economic challenge. South Africa is broadly self-sufficient in food production, yet many households experience hunger due to poverty and limited income. Nationally, 19.9% of households report running out of food, with the Northern Cape (27.6%) and Eastern Cape (26.3%) being the worst affected.

In Lejweleputswa, 27.7% of households reported running out of money to buy food, with Masilonyana and Matjhabeng showing similar trends.

Table 12-16: Level of Household Food in the last 12 Months (Community Survey 2016)

Food (in)security indicator	Matjhabeng		Masilonyana		Lejweleputswa	
	Population	%	Population	%	Population	%
Prevalence of running out of money to buy food	37869	25,4	6534	30,3	60204	27,7
Skipped a meal	25974	17	4228	19,6	41239	18,9%

Socio-economic downturns continue to affect food security in both municipalities. Approximately one in four households (25.4%) in Matjhabeng reported running out of money to buy food, while 17% had skipped meals. The situation is more severe in Masilonyana, where 30.3% of households reported insufficient funds for food and 19.6% had skipped meals.

The Covid-19 pandemic further exacerbated food insecurity. Widespread job losses increased household dependency ratios, placing additional pressure on already vulnerable communities. Without targeted interventions, the prevalence of hunger and malnutrition is likely to rise in both municipalities.

12.13.8 Health

The Human Immunodeficiency Virus (HIV) remains a major public health challenge in South Africa. While perspectives on the links between HIV/AIDS and socio-economic conditions vary, the United Nations Joint Programme on HIV/AIDS (UNAIDS, 2001) has identified factors such as poverty, underdevelopment, limited opportunities, and a lack of control over one’s future as significant contributors to the spread of the epidemic.

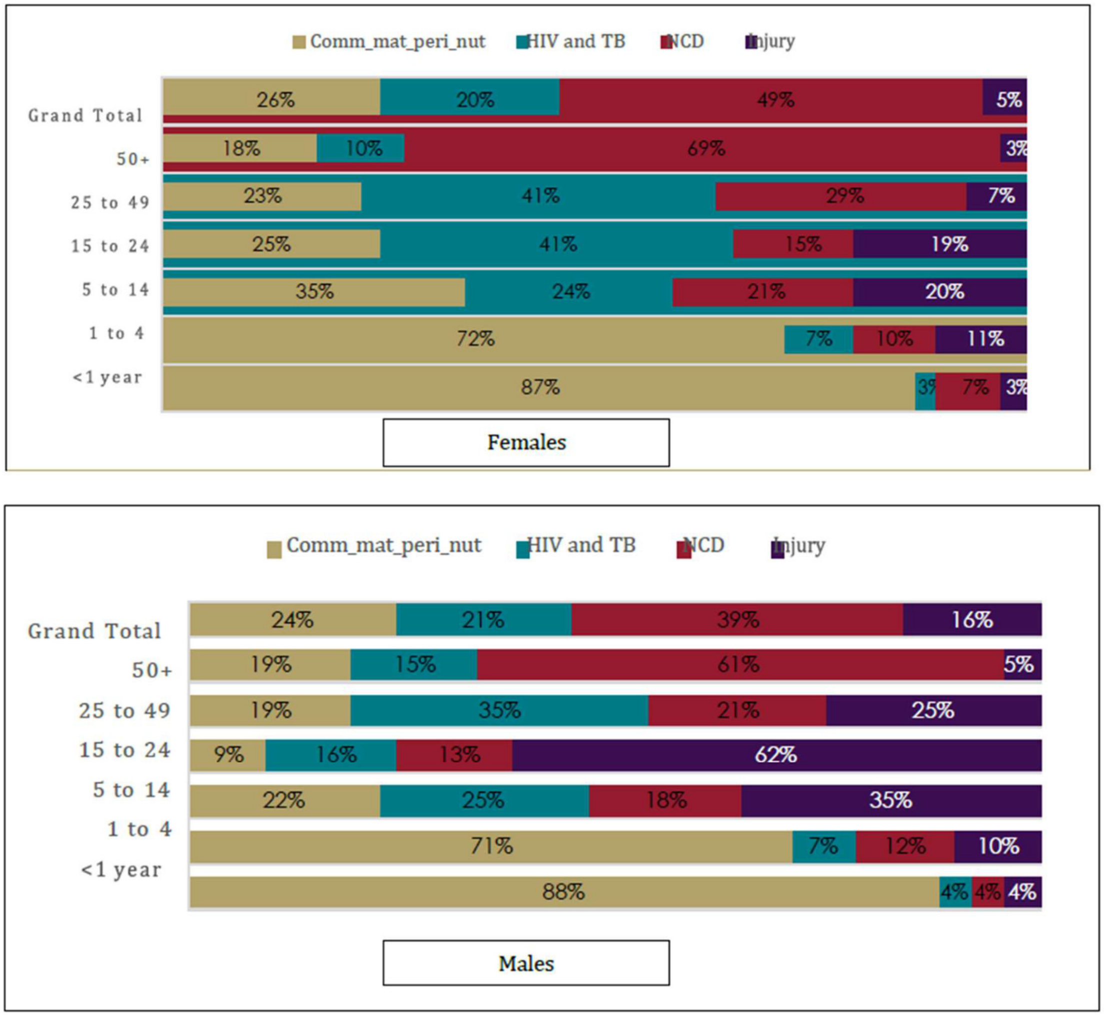


Figure 12-83: Percentage of the population affected by HIV/AIDS in relation to the poverty levels in South Africa (Lejweleputswa District Health Profile)

Lejweleputswa District has also been severely impacted by the Covid-19 pandemic. The Free State accounted for 5.6% of all confirmed Covid-19 cases in South Africa, and Lejweleputswa demonstrated high vulnerability in terms of both transmission potential and health susceptibility.

The socio-economic impacts of Covid-19 have been far-reaching. The pandemic not only disrupted daily life but also destabilised demographic patterns. South Africa's crude death rate increased significantly from 8.7 deaths per 1 000 people in 2020 to 11.6 deaths per 1 000 people in 2021. This sharp rise in fatalities resulted in a decline in life expectancy at birth in 2021 and placed additional strain on the national fiscus.

Covid-19 also exposed and deepened existing socio-economic inequalities. The pandemic magnified vulnerabilities within the economy, particularly the structural weaknesses associated with "jobless" economic growth. Building resilience to such shocks—whether from pandemics or broader challenges such as climate change—emerges as one of the most viable long term strategies to address poverty and socio-economic vulnerability in the Free State Province.

13 IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY OF THE IMPACTS, INCLUDING THE DEGREE TO WHICH THESE IMPACTS

13.1 Impacts and Risks Identified in the Approved EMPr of 2004

The following summary of potential impacts and associated management measures has been extracted and aligned from the approved EMPr for Beatrix Mine (Beatrix Mine, 2004). The assessment addresses both environmental and socio-economic aspects across the operational phase (Table 13-1) and the decommissioning phase (Table 13-2).

It is noted that the impact assessment methodology applied in the 2004 EMPr is now outdated. Furthermore, additional specialist studies have since been undertaken, providing updated baseline information and refined impact analyses. As such, the impact and risk assessment for Beatrix 4 Shaft will be revised and updated to ensure alignment with current regulatory requirements, contemporary best practice, and site-specific conditions.

Table 13-1: Operational Phase Impacts and Mitigation (Beatrix Mine, 2004)

Aspect	Description of Impact	Impact Assessment	Management and Mitigation Measures
Geology	Deep-level mining occurs below surface; no surface or near-surface geological disturbances. Undermining has no risk of subsidence at current depths.	Impact insignificant; geology unaffected.	No specific mitigation required. Routine monitoring of ground stability continues.
Topography	Limited surface disturbance, primarily linked to waste dumps, slimes dam, evaporation dams, and infrastructure. Broader topography remains unchanged.	Definite; off-site extent; permanent; low significance.	Limit infrastructure footprint; rehabilitate disturbed areas progressively; contour and shape dumps/dams to blend with surrounding terrain.
Soils	Localised impacts at slimes dams, waste rock dumps, solid waste disposal, and evaporation dams. Risk of saline seepage affecting soils.	Possible; off-site; medium duration; medium significance.	Strip and stockpile topsoil prior to new developments; rehabilitate using stored topsoil; monitor soil salinity; leaching expected post closure to restore some usability.
Land Capability	Majority of land unaffected and remains suitable for agriculture/grazing. Areas sterilised: tailing storage facilities (TSFs), waste rock dumps (WRDs), solid waste disposal, and evaporation dams (limited to grazing potential).	Definite; site extent; permanent; medium significance.	Reuse stripped topsoil for rehabilitation of disturbed areas; progressive rehabilitation; ensure agricultural capability restored where possible.
Land Use	Permanent sterilisation of TSF, WRD, and solid waste disposal areas. Evaporation dams partially sterilised but may recover with leaching.	Definite; site extent; permanent; medium significance.	Engage Department of Agriculture; rehabilitation to restore grazing potential; apply soil amelioration and water management to facilitate recovery.
Vegetation	Most natural vegetation already lost due to farming. Sensitive areas limited to riparian zones. Alien species (e.g. tamarisk) established	Definite; site extent; permanent; low	Implement alien plant eradication programmes; enforce vehicle controls to protect bulbs; progressive

Aspect	Description of Impact	Impact Assessment	Management and Mitigation Measures
	around dams. Protected bulbs may be disturbed.	to medium significance.	rehabilitation with indigenous vegetation.
Fauna	Limited pre-mining fauna due to farming. Evaporation dams increased bird life and game introduced. Impacts: habitat loss, disturbance (slimes dam, construction), and potential harm to protected lizards.	Definite; site extent; medium to long term; medium significance.	Maintain game sanctuary; protect sensitive fauna habitats (e.g. riparian areas); minimise disturbance during construction; monitor protected species.
Surface Water	Catchment yield unaffected (<0.001% reduction). Water quality impacted by seepage from dams; elevated EC and chlorides at compliance points S6 & S7.	Definite; regional; long term; high significance.	Maintain evaporation dam capacity (1:100 year storm); continue compliance monitoring; implement seepage interception drains; manage sewage effluent dilution.
Groundwater	Pollution plume migration from TSF/evaporation dams. Boreholes downgradient (e.g. Uys, Pretorius farms) impacted. Contamination spread mainly eastwards to Theron Spruit.	Definite; regional; long term; high significance.	Maintain and extend borehole monitoring; apply French drains/seepage interception; supply clean water to affected farmers; relocate sensitive infrastructure where required.
Air Quality	Dust from haul roads, dumps, and TSF; fumes from boilers, acid tanks, and smelt house controlled by scrubbers and filters. Ammonia risk from refrigeration plant (low probability, high consequence).	Probable; site extent; short-term to medium-term; low to medium significance.	Dust suppression (sprays, vegetation); maintain filters/scrubbers; emergency response plan for ammonia leaks; air quality monitoring.
Noise	Noise from shafts, mills, and workshops (up to 90 dB). Mostly site-limited, managed with personal protective equipment (PPE).	Definite; site extent; short-term; low significance.	Provide hearing protection; restrict noisy operations to daytime; maintain equipment to reduce noise.
Archaeological and Cultural Resources	No sites of significance identified.	No impact.	No action required unless new finds occur (chance find procedure).
Visual	Visual intrusion from WRDs, TSFs, evaporation dams, trenches, and headgear. Goldfields landscape already dominated by similar infrastructure.	Definite; site extent; permanent; low significance.	Shape dumps/dams; vegetate slopes; design infrastructure to reduce visual intrusion.
Socio-Economic	Significant positive contribution to regional economy (employment, services, taxes). Risk of unemployment after closure.	Definite; regional; long term; positive impact outweighs negatives.	Maintain Social and Labour Plan commitments; support local industries; plan for closure transition with community engagement.
Interested and Affected Parties	Most concerns relate to water quality (farmers, landowners). Complaints recorded since 1980s; mitigated through engagement and technical interventions.	Definite; site/regional extent; long term; medium to high significance.	Maintain open-door policy; provide replacement water where needed; continue stakeholder engagement.

Table 13-2: Decommissioning Phase Impacts and Mitigation

Aspect	Description of Impact	Impact Assessment	Management and Mitigation Measures
Surface Water	Reduced contaminated water volumes due to aquifer drawdown; residual seepage from dams persists.	Definite; site to regional; medium-term; low to medium significance.	Maintain surface water monitoring; manage effluent; implement contingency for seepage.

Aspect	Description of Impact	Impact Assessment	Management and Mitigation Measures
Groundwater	Residual plume migration from TSFs and evaporation dams. Long term contamination risk.	Definite; regional; long term; medium to high significance.	Extend groundwater monitoring network; model plume migration; apply interception drains; provide alternative water for affected land users.
Demolition	Noise, dust, and hazardous waste risks from infrastructure removal. Asbestos and contaminated materials pose risks.	Definite; site-specific; short-term; medium significance.	Dust suppression; asbestos management; waste segregation and recycling; personal protective equipment (PPE) for workers; phased demolition scheduling.
Soils	Soil disturbance, compaction, and contamination during demolition.	Possible; site-specific; medium-term; medium significance.	Strip/store topsoil; remediate contaminated soils; decompact; rehabilitate with indigenous grasses.
Air Quality	Dust emissions from demolition, haulage, and dumps. Machinery emissions also possible.	Probable; site-specific; short-term; low to medium significance.	Dust suppression; restrict haulage to wet conditions; maintain vehicles; monitor dust at sensitive receptors.
Noise	Temporary increases from heavy demolition machinery.	Definite; site-specific; short-term; low significance.	Restrict working hours; provide personal protective equipment (PPE); maintain equipment; monitor noise levels.
Visual	Removal of large structures alters landscape appearance; temporary visual disturbance until rehabilitation occurs.	Definite; site-specific; medium-term; low significance.	Concurrent rehabilitation; vegetation establishment; erosion control.
Socio-Economic	Loss of operational employment; limited new opportunities during rehabilitation. Risk of economic downturn in mining-dependent area.	Definite; local to regional; short to medium-term; medium significance (negative).	Prioritise local contractors for rehabilitation; implement Social and Labour Plan closure measures; offer retraining and skills transfer.

13.2 Methodology used in Determining and Ranking the Nature, Significance, Consequences, Extent, Duration and Probability of Potential Environmental Impacts and Risks

The assessment of potential environmental and socio-economic impacts is undertaken through a structured risk-based methodology. This ensures consistency and transparency in how the significance of each impact is determined, allowing for effective prioritisation of management and mitigation measures. The approach evaluates three key components: Probability, Magnitude, and Severity.

13.2.1 Step 1: Determination of Probability

The probability of an impact occurring is established by averaging three factors:

- Frequency of the aspect or event (how often the event may occur).
- Availability of a pathway between the source and the receptor.
- Availability of the receptor (sensitivity or presence of the receptor).

The scoring criteria are set out in Table 13-3.

Table 13-3: Determination of Probability of Impact

Score	Frequency of aspect / unwanted event	Availability of pathway from the source to the receptor	Availability of receptor
1	Never known to have happened, but may happen	A pathway to allow for the impact to occur is never available	The receptor is never available
2	Known to happen in industry	A pathway to allow for the impact to occur is almost never available	The receptor is almost never available
3	< once a year	A pathway to allow for the impact to occur is sometimes available	The receptor is sometimes available
4	Once per year to up to once per month	A pathway to allow for the impact to occur is almost always available	The receptor is almost always available
5	Once a month - Continuous	A pathway to allow for the impact to occur is always available	The receptor is always available

Note: The final probability score is calculated as the average of these three factors.

13.2.2 Step 2: Determination of Magnitude

Magnitude reflects the seriousness of the impact in terms of scale, intensity, reversibility, and the sensitivity of the receiving environment. It is calculated by averaging the following:

- Duration of the impact.
- Extent of the impact.
- Volume/quantity/intensity of the aspect.
- Toxicity or destructive effect.
- Reversibility of the impact.
- Sensitivity of the receptor.

The criteria are detailed in Table 13-5.

13.2.3 Step 3: Determination of Severity

The final step is to determine the severity of the impact by plotting the average probability score (from Table 13-3) against the average magnitude score (from Table 13-5). The result is ranked according to the risk matrix (Table 13-4), which categorises impacts from Low to High priority.

Table 13-4: Determination of Severity of Impact

Environmental impact rating / priority					
Probability	**Magnitude**				
	1 Minor	**2 Low**	**3 Medium**	**4 High**	**5 Major**
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Note: Severity represents the integrated outcome of both probability and magnitude, guiding the significance rating of the impact.

Table 13-5: Determination of Magnitude of Impact

Score	Source				Receptor	
	Duration of impact	**Extent**	**Volume / Quantity / Intensity**	**Toxicity / Destruction Effect**	**Reversibility**	**Sensitivity of environmental component**
1	Lasting days to a month	Effect limited to the site. (metres);	Very small quantities / volumes / intensity (e.g. < 50 ℓ or < 1 ha)	Non-toxic (e.g. water) / Very low potential to create damage or destruction to the environment	Biophysical and/or social functions and/or processes will remain unaltered	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity
2	Lasting 1 month to 1 year	Effect limited to the activity and its immediate surroundings. (tens of metres)	Small quantities / volumes / intensity (e.g. 50 ℓ to 210 ℓ or 1 ha to 5 ha)	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	Biophysical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components
3	Lasting 1 – 5 years	Impacts on extended area beyond site boundary (hundreds of metres)	Moderate quantities / volumes / intensity (e.g. > 210 ℓ < 5000 ℓ or 5 – 8 ha)	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	Biophysical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce / valuable environment etc.)
4	Lasting 5 years to Life of Organisation	Impact on local scale / adjacent sites (km's)	Very large quantities / volumes / intensity (e.g. 5000 ℓ - 10 000 ℓ or 8 ha- 12 ha)	Toxic (e.g. diesel & Sodium Hydroxide)	Biophysical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	Current environmental component(s) are in a natural state. Environmentally sensitive environment / receptor (endangered species / habitats etc.)
5	Beyond life of Organisation / Permanent impacts	Extends widely (nationally or globally)	Very large quantities / volumes / intensity (e.g. > 10 000 ℓ or > 12 ha)	Highly toxic (e.g. arsenic or TCE)	Biophysical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, protected habitats etc.)

Note: The magnitude score is derived by averaging the six contributing factors.

13.3 The Positive and Negative Impacts that the Proposed Activity (in Terms of the Initial Site Layout) and Alternatives will have on the Environment and the Community that may be Affected

13.3.1 Operational Phase

During the operational phase, the proposed Beatrix 4 Shaft activities will have a mix of positive and negative impacts on both the environment and the surrounding communities. On the positive side, operations will generate significant socio-economic benefits, including sustained employment opportunities, contributions to the regional economy, procurement from local businesses, and tax revenues that support national development. SLP commitments will further strengthen skills development, community services, and infrastructure in neighbouring areas.

On the negative side, deep-level mining and the associated infrastructure will place pressure on environmental resources. Key risks include contamination of surface water and groundwater through seepage from TSFs, WRDs, and evaporation dams. Elevated EC and chloride levels have been detected at compliance points, indicating ongoing risks of water quality deterioration. Air quality may be affected by dust emissions from haul roads and waste facilities, while noise from shafts, mills, and workshops, though compliant with standards, may still disturb workers and surrounding receptors. Habitat loss and alien vegetation encroachment remain risks for biodiversity, though localised due to pre-existing agricultural transformation. Communities are most concerned about long term water availability and quality, and while mitigation strategies exist, these impacts remain significant without sustained management.

13.3.2 Decommissioning Phase

In the decommissioning phase, the project will bring about both closure-related risks and potential long term benefits. Positive impacts will include the opportunity to rehabilitate disturbed landforms, restore grazing capability, re-establish indigenous vegetation, and reduce legacy risks through dismantling and remediation of contaminated facilities. Closure planning, if executed effectively, will allow portions of the landscape to return to productive or ecological use, supporting grazing and biodiversity corridors.

However, the negative impacts are substantial if unmanaged. Residual contamination of groundwater from historic TSFs and evaporation dams may persist for decades, with the risk of plume migration affecting agricultural users downstream. Demolition activities carry risks of dust, hazardous waste generation (including asbestos and hydrocarbons), and short-term noise increases. Soils may suffer further compaction and contamination during dismantling, while the permanent sterilisation of land beneath mining infrastructure will reduce agricultural land capability. Socio-economically, closure will result in significant job losses and reduced economic activity in the Matjhabeng and Masilonyana areas, where communities are heavily reliant on mining. Unless offset by retraining and closure-focused SLP initiatives, these impacts will contribute to local economic downturns.

13.4 The Possible Mitigation Measures that could be Applied and the Level of Risk

Mitigation measures for the Beatrix 4 Shaft recommissioning are structured to address both environmental and socio-economic aspects throughout the operational and decommissioning phases. The primary focus is on preventing significant adverse impacts, reducing risks to low or medium levels where possible, and ensuring compliance with applicable South African legislation and licence conditions.

For water resources, key measures will include maintaining and extending the borehole monitoring network, installing seepage interception drains, and implementing source control measures such as improved lining systems and containment for tailings and return water dams. Regular groundwater and surface water monitoring, supported by a TARP, will enable early detection and remediation of plume migration, thereby lowering the risk of long term contamination from high to medium significance.

In relation to air quality, continuous dust suppression during operational haulage and decommissioning demolition will be applied, combined with vegetation establishment on disturbed surfaces. Filters, scrubbers, and abatement systems at key emission points will be maintained to comply with the NEMAQA. These interventions reduce dust and gaseous emissions to acceptable levels, with residual risks considered low after mitigation.

Noise impacts from ventilation fans, machinery, and demolition activities will be mitigated by scheduling high-noise work during daytime hours, upgrading equipment, applying damping technology, and enforcing personal protective equipment (PPE) for workers. While temporary elevated noise is expected during decommissioning, these measures will ensure that long term risks remain low.

For heritage resources, chance find procedures, buffer zones, and staff awareness training will be applied during operations, while decommissioning will be guided by a Heritage Management Plan and consultation with relevant authorities. These steps will protect identified heritage features such as farmsteads, cemeteries, and archaeological sites, keeping risks low to medium depending on-site sensitivity.

Biodiversity risks will be managed through alien invasive plant eradication, progressive rehabilitation with indigenous species, and protection of riparian and wetland habitats. These measures lower habitat loss and faunal disturbance impacts from medium to low significance in the long term.

Finally, socio-economic risks, including job losses during decommissioning, will be managed through the SLP, prioritisation of local contractors during rehabilitation, skills retraining, and transparent stakeholder engagement. While employment loss cannot be fully mitigated, these interventions reduce risks to medium significance and provide opportunities for local economic resilience.

Overall risk level: After applying the mitigation measures outlined above, most environmental and socio-economic risks are reduced to low or medium significance, with water resources and socio-economic conditions remaining the most sensitive receptors requiring ongoing monitoring and adaptive management.

13.5 Motivation where no Alternative Sites were Considered

In the case of Beatrix 4 Shaft, no alternative sites could be considered due to the fixed nature of the mineral resource.

The orebody is geologically located within the Witwatersrand Basin, specifically in the Free State Goldfields. As a mineral deposit, its geographic position is immovable, and mining operations are restricted to the boundaries of the authorised MR area. The mineral body cannot be relocated, and extraction can therefore only occur within the defined footprint already established and authorised for mining activities.

For this reason, no site alternatives are feasible or reasonable. The preferred option—continuing operations within the existing Beatrix 4 Shaft area—represents the only viable and practical approach.

13.6 Statement Motivating the Alternative Development Location within the Overall Site

The development footprint is constrained by the fixed location of the mineral resource within the Witwatersrand Basin and the pre-existing infrastructure associated with Beatrix 4 Shaft. The shaft, underground workings, pumping systems, and supporting surface facilities have already been established and authorised under the MR and approved EMPr.

Locating the development within the existing Beatrix 4 Shaft footprint ensures optimal use of previously disturbed land, thereby avoiding unnecessary disturbance of undisturbed areas and minimising additional environmental impacts. The existing shaft and associated infrastructure were originally designed to support safe and efficient access to the orebody and remain adequate for the proposed recommissioning.

Alternative development locations within the overall site were considered unnecessary, as the current location provides the most efficient alignment with operational, environmental, and regulatory requirements. Any shift away from the established footprint would increase costs, extend permitting timelines, and result in additional land disturbance without delivering commensurate benefits.

For these reasons, the existing Beatrix 4 Shaft location is the most practical and responsible development location within the overall site.

13.7 Full Description of the Process Undertaken to Identify, Assess and Rank the Impacts and Risks the Activity will Impose on the Preferred Site (in Respect of the Final Site Layout Plan) Through the Life of the Activity

The process of identifying, assessing, and ranking potential environmental and socio-economic impacts associated was undertaken using a structured, risk-based approach. This ensures that all impacts are evaluated consistently, transparently, and in accordance with current regulatory requirements and contemporary best practice. The process included the following key steps:

13.7.1 Step 1: Identification of Potential Impacts and Risks

Impacts were identified through:

- A review of the approved EMPr (2004), including historical monitoring records and stakeholder concerns.
- Integration of updated specialist studies and baseline data relating to groundwater, surface water, biodiversity, heritage, air quality, noise, and socio-economic conditions.
- Consideration of the full project lifecycle, namely the operational phase, decommissioning phase, and closure obligations.

13.7.2 Step 2: Categorisation of Impacts

Identified impacts were categorised into biophysical (e.g., geology, soils, vegetation, fauna, water resources, and air quality), social (e.g., heritage, visual, land use), and socio-economic (e.g., employment, local development, stakeholder concerns) components. This ensured a comprehensive and multidisciplinary assessment.

13.7.3 Step 3: Assessment of Impact Probability

For each identified impact, the probability of occurrence was calculated based on:

- The frequency or likelihood of the event/aspect arising.
- The presence or absence of a pathway between the source and receptor.
- The availability and sensitivity of the receptor.

Probability was scored using the criteria set out in Table 13-3.

13.7.4 Step 4: Assessment of Impact Magnitude

Magnitude was determined by averaging six factors:

- Duration of the impact.
- Geographic extent.
- Intensity/volume of the activity.
- Toxicity or destructive effect.
- Degree of reversibility.
- Sensitivity of the receptor environment.

Magnitude was scored using the criteria set out in Table 13-5.

13.7.5 Step 5: Determination of Severity and Significance

The probability and magnitude scores were integrated using the risk matrix in Table 13-4. This step ranked each impact from Low to High, thereby determining its severity and significance. This approach enabled prioritisation of high-risk impacts requiring strict management measures while ensuring proportionate effort for lower-risk issues.

13.7.6 Step 6: Application of Mitigation and Management Measures

For each impact, appropriate management and mitigation measures were identified. These measures were based on:

- Best practice guidelines.
- Recommendations from relevant specialists.
- Legal and regulatory requirements.
- Input from stakeholder engagement processes.

Mitigation was then re-applied to reassess the residual significance of each impact, ensuring that risks are reduced to acceptable levels.

13.7.7 Step 7: Iterative Review and Integration

The assessment was undertaken iteratively, allowing for refinement of the significance rankings where mitigation, monitoring, or design adjustments reduced potential risks. The process was further aligned with site-specific conditions and existing infrastructure constraints.

13.8 Assessment of Each Identified Potentially Significant Impact and Risk

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated: Probability	Significance If Unmitigated: Magnitude	Significance If Unmitigated: Significance	Management and Mitigation Measures	Significance If Mitigated: Probability	Significance If Mitigated: Magnitude	Significance If Mitigated: Significance
Deep-level mining below surface	Deep-level mining occurs without causing surface or near-surface geological disturbances, and the undermining at current depths poses no risk of subsidence.	Geology	Operational Decommissioning	No impact.						
Construction and operation of waste rock dumps, tailings storage facilities (TSFs), evaporation dams, and associated infrastructure	Establishment of engineered mining infrastructure causes localised alteration of the natural topography. Permanent landform changes are expected at waste disposal and water management facilities, while the broader highveld landscape remains largely unchanged. Potential for erosion, altered surface drainage patterns, and visual intrusion if unmanaged.	Topography	Operational	5	3	High	• Develop, implement and maintain a comprehensive Stormwater Management Plan to prevent erosion and control runoff across disturbed areas. • Carry out routine inspections of all stormwater trenches, berms and drains, and repair any erosion damage. • Shape and rehabilitate disturbed landforms progressively to blend with the surrounding topography and minimise long term visual intrusion.	3	2	Medium
Closure and rehabilitation of waste rock dumps, TSFs, evaporation dams, and associated infrastructure	During decommissioning, permanent engineered structures remain as altered landforms. Residual disturbance may persist without adequate rehabilitation. Risks include long term erosion, instability of steep slopes, and visual scarring.		Decommissioning	5	3	High	• Re-contour and stabilise disturbed landforms, particularly TSFs, WRDs, and evaporation dams, to reduce erosion risk and improve slope stability. • Establish indigenous vegetation cover to stabilise soils and promote ecological reintegration. • Implement closure planning to ensure that rehabilitated landforms blend with surrounding terrain and visual impacts are minimised.	3	2	Medium
Excavation, construction and operation of slimes dams, waste rock dumps (WRDs), evaporation dams, and waste disposal sites	Permanent sterilisation of soils within mine infrastructure footprints; seepage from evaporation dams may cause long term salinisation; sandy upland soils prone to erosion and valley-bottom soils prone to gulley erosion.	Soils	Operational	3	3	Medium	• Strip and stockpile topsoil before disturbance. • Progressive rehabilitation using stored soils. • Monitor soil salinity and erosion and implement corrective action.	2	2	Low
Closure of TSFs, WRDs and evaporation dams; demolition of infrastructure; reworking of contaminated soils	Residual soil degradation including compaction, salinisation, and erosion around TSFs, WRDs, and evaporation dams. If unmanaged, long term soil productivity is compromised.		Decommissioning	3	3	Medium	• Re-profile disturbed landforms. • Apply lime/soil ameliorants to sodic soils. • Reapply ≥300–500 mm topsoil and establish indigenous vegetation.	2	2	Low
Fuel storage, chemical handling, vehicle servicing, and waste disposal during operations	Hydrocarbon leaks, chemical spills, and waste mismanagement contaminate soils, reducing fertility and posing leaching risks to groundwater.		Operational	4	4	High	• Line and bund all hydrocarbon/chemical storage areas. • Use drip trays, spill kits, and hydrocarbon separators. • Segregate waste and use licensed disposal facilities. • Monitor soil quality near workshops and storage areas.	2	2	Low
Decommissioning and closure of fuel bays, workshops, storage facilities, and contaminated footprints	Residual hydrocarbon/chemical contamination in soils beneath workshops, fuel bays, and waste sites. If unmanaged, risks persist long term, hindering rehabilitation and land capability.		Decommissioning	4	4	High	• Excavate and dispose of contaminated soils at licensed sites. • Bioremediate hydrocarbon-impacted soils. • Demolish contaminated infrastructure to ≥1 m below ground. • Cap or ameliorate soils where excavation is not feasible.	2	2	Low
Placement and operation of TSFs, WRDs, evaporation dams, and waste disposal areas	Reduction in land capability in affected areas, with permanent loss of arable potential; majority of land outside mine footprints remains viable for grazing and crops.	Land Capability	Operational	5	3	High	• Reuse stripped topsoil in rehabilitation. • Progressive rehabilitation with grazing-compatible vegetation. • Implement erosion and dust control.	3	2	Medium
Decommissioning and rehabilitation of TSFs, WRDs and evaporation dams	Permanent loss of arable land in mine footprints if unmanaged; erosion and instability risks. Without intervention, rehabilitated land remains unsuitable for grazing.		Decommissioning	5	3	High	• Re-contour WRDs (1:3) and TSFs (1:4). • Apply ≥500 mm soil cover. • Establish vegetation for grazing potential.	3	2	Medium
Conversion of agricultural land to mining land use (TSFs, WRDs, waste disposal areas, evaporation dams)	Land use permanently altered, with agricultural land excluded from production; evaporation dams may partially recover for grazing.	Land Use	Operational	5	3	High	• Apply soil amelioration and water management to restore grazing potential.	3	2	Medium

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated			Management and Mitigation Measures	Significance If Mitigated		
				Probability	Magnitude	Significance		Probability	Magnitude	Significance
Post closure sterilisation of TSFs and WRDs; rehabilitation of evaporation dams and mine footprints	Land use remains permanently altered post-mining; sterilised zones persist, though rehabilitation can support grazing and ecological corridors.		Decommissioning	5	3	H	• Finalise post-mining land use with stakeholders. • Rehabilitate to support grazing and ecological corridors. • Long term monitoring of rehabilitated areas.	3	2	Medium
Gold Processing Plant – storage and use of chemicals (cyanide, caustic, lime, carbon, flocculant)	Spillages/leakages may contaminate soils, groundwater, and surface water, with risks to aquatic ecosystems and nearby communities.	Surface and groundwater	Operational	4	3	High	• All chemical storage tanks and containers to be located within bunded areas with impermeable linings, sized to contain at least 110% of the largest container. • Install oil and silt separators on all wash bays, sumps, and drains linked to dirty water systems. • Develop and implement a hazardous substances and chemical handling procedure aligned with the National Water Act (Act 36 of 1998) and the Occupational Health and Safety Act. • Provide annual training to all staff on safe handling, use of personal protective equipment, spill prevention, and emergency procedures. • Conduct quarterly drills simulating chemical and hydrocarbon spill scenarios. • Maintain Material Safety Data Sheets for all chemicals at point of use and storage. • Immediately clean any spillages and transport contaminated materials to licensed hazardous waste disposal facilities. • Undertake monthly surface water and groundwater quality monitoring at upstream and downstream compliance points. • Conduct biennial compliance audits against Government Notice 704 of 1999 requirements to verify clean/dirty water separation.	1	3	Low
Decommissioning of Gold Processing Plant – dismantling, demolition, removal of chemical storage tanks and infrastructure	Residual contamination from decommissioning activities may result in hydrocarbon and chemical releases to soils, groundwater, and surface water.		Decommissioning	4	3	High	• All hazardous chemicals, hydrocarbons, and contaminated materials to be removed and transported to licensed hazardous waste facilities. • Establish a salvage yard for decontamination of reusable equipment, ensuring runoff collection and treatment. • Excavate and bioremediate hydrocarbon-contaminated soils using appropriate techniques such as biopiles or in situ treatment. • Maintain stormwater separation during demolition with diversion berms, channels, and lined containment areas. • Conduct groundwater and surface water monitoring for at least five years post closure to confirm rehabilitation success and detect residual contamination. • Maintain a closure register documenting waste volumes, disposal certificates, and decontamination activities for auditing purposes.	2	2	Low
Underground mining – drilling, blasting, explosives handling, equipment use, hoisting	Hydrocarbon/nitrate contamination of groundwater from explosives and equipment; spillages entering water circuits or shaft complexes.		Operational	4	2	Medium	• Implement water and stormwater management plans to ensure separation of clean and dirty water underground and on surface. • Maintain underground equipment and vehicles on planned maintenance schedules to reduce oil and fuel leaks. • Use drip trays and bunded storage for hydrocarbons and lubricants. • Conduct blasting according to national explosives legislation, with emphasis on minimising nitrate residues. • Store explosives in licensed magazines designed for safe ventilation and contamination prevention. • Monitor groundwater quality monthly for nitrates, hydrocarbons, and other contaminants. • Conduct annual hydrogeological reviews of monitoring data. • Develop, train, and drill emergency spill and explosion response procedures.	2	1	Low

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated			Management and Mitigation Measures	Significance If Mitigated		
				Probability	Magnitude	Significance		Probability	Magnitude	Significance
							• Ensure all waste from explosive destruction is disposed of at approved hazardous facilities.			
Decommissioning of underground workings – plugging shafts, removing equipment, sealing access	Residual nitrates, oils, and contaminants in underground water circuits may leach post closure, affecting groundwater and surface water quality.		Decommissioning	3	2	Medium	• Seal shafts and underground access points with reinforced concrete plugs designed to withstand long term water pressures. • Remove all equipment, pipelines, and hydrocarbon storage facilities underground. • Pump and treat water during closure where necessary to remove contaminants. • Establish a post closure groundwater monitoring programme for at least five years to detect residual nitrate or hydrocarbon leaching. • Install interception trenches or drains if monitoring shows continued contamination migration. • Maintain closure certificates and reports for regulatory compliance.	2	1	Low
Workshops – vehicle/equipment maintenance, hydrocarbons and chemicals	Spillages/runoff may contaminate soil and water circuits.		Operational	4	1	Low	• All maintenance to be confined to designated impermeable maintenance bays connected to dirty water systems. • Equip maintenance bays and wash bays with oil and silt separators. • Conduct planned maintenance to prevent leaks. • Implement spill response and waste disposal procedures, including immediate clean-up. • Train all mechanical staff in environmental management and pollution prevention. • Monitor drainage and oil separators monthly and service quarterly. • Transport contaminated waste to licensed disposal sites.	2	1	Low
Decommissioning of workshops – dismantling and rehabilitation of maintenance areas	Hydrocarbon-contaminated soils and residual waste may leach into soils and water resources during closure.		Decommissioning	3	2	Medium	• Remove all tanks, bays, and hydrocarbon-contaminated infrastructure. • Excavate contaminated soils and treat through bioremediation or off-site disposal. • Rip compacted areas, re-profile land, and spread topsoil. • Establish indigenous vegetation on rehabilitated areas. • Conduct post-rehabilitation surface and groundwater monitoring for at least three years.	2	1	Low
Waste management - salvage yards and office complexes	Incorrect separation may contaminate waste streams and water resources.		Operational	5	3	High	• Implement separation of general waste and hazardous waste at the point of generation, with clearly labelled, weatherproof containers on impermeable, bunded surfaces. • Establish covered, bunded temporary storage areas with runoff collection and connection to the dirty water system; prevent water ingress. • Prepare and implement a Waste Management Plan in accordance with the National Environmental Management: Waste Act, including waste minimisation, reuse, and recycling targets. • Maintain an auditable waste register and waste manifest system, including quantities, South African classifications, consignment notes, and safe disposal certificates. • Appoint only licensed waste transporters and use only licensed treatment and disposal facilities; verify licences annually. • Train all staff and contractors on waste segregation, spill response, and housekeeping; conduct quarterly toolbox talks. • Conduct monthly inspections of storage areas; immediately rectify non-conformances. • Install litter screens and conduct routine clean-ups to prevent windblown waste reaching stormwater systems.	3	1	Low
Decommissioning of salvage yards/offices – removal of	Residual hazardous waste or poor clean-up could leach contaminants into soils and water.		Decommissioning	3	3	Medium	• Undertake a pre-demolition hazardous materials survey (including asbestos, oil-containing equipment, lead-based paints, fluorescent	2	1	Low

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated			Management and Mitigation Measures	Significance If Mitigated		
				Probability	Magnitude	Significance		Probability	Magnitude	Significance
waste facilities, demolition of buildings, clean-up							tubes, and electronic waste) and prepare method statements for removal. • Remove all wastes and contaminated materials to licensed facilities prior to demolition; obtain and file safe disposal certificates. • Decontaminate salvage areas (pressure wash on lined bays with runoff capture and treatment) and verify through confirmatory sampling. • Excavate visibly contaminated soils; treat by bioremediation or dispose at licensed facilities based on laboratory classification. • Re-profile, rip, replace topsoil, and revegetate footprints; install erosion and sediment controls. • Conduct a final waste audit and a closure verification sampling programme for soils and runoff; include at least one wet season check.			
Tailings disposal – Beatrix No.2 TSF	Overflow, pipe bursts, or slope failures may release contaminated runoff to surface and groundwater.		Operational	4	3	High	• Maintain minimum freeboard in ponds and dams that complies with Government Notice 704 of 1999 (operate at less than 0.8 metres from crest); record levels weekly and after storms. • Implement a Code of Practice for Mine Residue Deposits and audit compliance annually; close out findings within defined timeframes. • Maintain the Stormwater Management Plan for paddocks, penstocks, decant trenches, and return water systems; keep channels free of sediment and vegetation. • Conduct routine integrity inspections of tailings pipelines; install pressure monitors and automatic shut-off valves at high-risk sections; keep spill kits along routes. • Undertake periodic geotechnical inspections of embankments (crest, slopes, toe drains); repair erosion promptly and maintain slope protection. • Perform leachate characterisation of tailings to identify parameters of concern and adjust monitoring suites accordingly. • Maintain an emergency preparedness and response plan for pipeline failures and potential tailings storage facility instability; conduct drills at least annually.	3	1	Low
Decommissioning of TSFs – capping, reshaping, revegetation	Long term seepage of sulphates, chlorides, and uranium may contaminate groundwater and surface water.		Decommissioning	5	4	High	• Construct an engineered cover system: shape outer slopes to one vertical to four horizontal or flatter; install at least five hundred millimetres of growth medium, with lime and fertiliser as required by soil testing; place a low-permeability layer where risk assessments justify. • Install surface water diversion berms, contour drains, and energy dissipation structures to prevent erosion; line high-velocity sections. • Establish indigenous, deep-rooted vegetation for erosion control and evapotranspiration; implement a three-year maintenance and reseeding programme. • Monitor groundwater and surface water for at least five years post closure; expand monitoring if upward trends are detected. • Where required by risk assessment, install toe drains, passive treatment wetlands, or seepage collection trenches. • Maintain access control and signage to prevent unauthorised disturbance of the rehabilitated facility.	3	2	Medium
Water management facilities – TSFs, RWDs, evaporation dams, reticulation systems	Overflows/discharges during flood events may contaminate surface waters.		Operational	4	4	High	• Demonstrate storage capacity for at least a one in fifty year storm event through a site water balance; update monthly and after material changes.	3	2	Medium

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated			Management and Mitigation Measures	Significance If Mitigated		
				Probability	Magnitude	Significance		Probability	Magnitude	Significance
							• Operate all dams below the freeboard required by Government Notice 704 of 1999; install level alarms and backup pumping capacity. • Inspect embankments, spillways, valves, and penstocks weekly; repair defects immediately. • Maintain separation of clean water and affected water; keep clean water diversions unobstructed; route affected runoff to the dirty water system. • Prohibit any deliberate discharge of process water to the environment without an authorisation in terms of the National Water Act, 1998 (Act 36 of 1998). • Implement an incident reporting procedure for any unplanned releases, including internal and external notification to the Department of Water and Sanitation (DWS) in terms of section 20 of the National Water Act, where applicable. • Monitor upstream and downstream surface water quality and dam inlets and outlets; investigate and correct any exceedances promptly.			
Decommissioning of dams/ponds – sediment removal, wall breaching, re-profiling	Residual sediments and contaminated water may leach into soils and surface waters post closure.		Decommissioning	4	3	High	• Dewater ponds, remove contaminated sediments to the tailings storage facility or licensed disposal sites based on classification, and keep records. • Remove or shred synthetic liners and dispose at licensed facilities; verify liner removal by inspection. • Breach embankments to prevent future impoundment; shape basins to free-draining contours; stabilise outlets with rock armour or concrete as needed. • Rip compacted surfaces, place topsoil, apply ameliorants (for example lime at agronomic rates), and establish vegetation. • Conduct post closure water quality monitoring in adjacent surface water bodies and downstream points for a minimum of three years.	2	2	Low
Dormant WRDs	Runoff/seepage may contaminate groundwater and surface water.		Operational	4	3	High	• Maintain clean water diversions around dump footprints; route dirty runoff to the dirty water system or containment. • Stabilise slopes with benching, contouring, and vegetation to reduce erosion; install energy dissipation at outlets. • Characterise waste rock for acid generation and leachable metals; update risk assessments and monitoring suites accordingly. • Inspect monthly for erosion, rilling, or ponding; repair immediately. • Implement a Code of Practice for waste rock dumps, including access control and traffic management to minimise track-induced erosion.	3	1	Low
Decommissioning of WRDs – reshaping, capping, vegetation	Residual seepage and erosion from rehabilitated WRDs may still affect water resources.		Decommissioning	4	3	High	• Reshape dumps to stable angles with berms and benches; construct perimeter drains and toe protection. • Place a soil cover of suitable thickness (typically three hundred to five hundred millimetres) based on erosion risk; include an optional low-permeability layer if justified. • Establish indigenous vegetation; apply mulch, fertiliser, and soil conditioners to achieve rapid cover; maintain for at least three growing seasons. • Monitor runoff quality, erosion features, and vegetation success; repair gullies with rock check dams or gabions. • Maintain long term access control and signage.	3	2	Medium
Waste water treatment works discharges at 4 Shaft	Poorly treated effluent may deteriorate surface/groundwater quality.		Operational	3	2	Medium	• Operate treatment works to achieve DWS licence limits; calibrate instruments and verify through accredited laboratory analysis.	2	1	Low

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated			Management and Mitigation Measures	Significance If Mitigated		
				Probability	Magnitude	Significance		Probability	Magnitude	Significance
							• Implement process controls (for example nutrient removal and disinfection) to maintain consistent compliance. • Conduct biomonitoring of receiving streams at agreed frequencies; trigger investigations if biological indices decline. • Maintain emergency storage and bypass prevention measures; prohibit uncontrolled discharges. • Report any significant non-compliance to the DWS and implement corrective actions.			
Decommissioning of WWTWs – closure of treatment works	Abandonment may leave contaminated liners/soils, leaching into water.		Decommissioning	3	3	Medium	• Drain and clean tanks and basins; remove sludge and dispose at licensed facilities; obtain safe disposal certificates. • Remove liners, contaminated soils, and process residues; verify by confirmatory laboratory sampling. • Backfill excavations with suitable material, re-profile, replace topsoil, and revegetate. • Monitor adjacent surface water and groundwater for at least two wet seasons to confirm no residual impact.	2	1	Low
Use and maintenance of vehicles	Hydrocarbon leaks may contaminate soils and stormwater.		Operational	3	1	Low	• Conduct all servicing on impermeable, bunded surfaces connected to the dirty water system with oil and silt separators. • Implement preventive maintenance to minimise leaks; keep spill kits in all parking and loading areas. • Train operators in refuelling and spill response; clean spills immediately and dispose contaminated materials at licensed facilities. • Inspect separators monthly and service quarterly.	2	1	Low
Decommissioning of vehicle yards/parking areas	Hydrocarbon-contaminated soils may remain and leach post closure.		Decommissioning	3	2	Medium	• Survey yards for staining; excavate and treat contaminated soils by bioremediation or off-site disposal. • Remove hardstands where not required for future land use; rip compacted subgrades; replace topsoil and revegetate. • Verify by confirmatory sampling that hydrocarbon concentrations meet closure criteria.	2	1	Low
Diesel and oil storage/refuelling	Spillages contaminating soils, groundwater, and stormwater.		Operational	3	3	Medium	• Provide bunded, roofed storage with impermeable linings; bund capacity at least one hundred and ten percent of the largest tank. • Protect tanks with overfill prevention, automatic shut-off, and leak detection; inspect daily for leaks and monthly for integrity. • Conduct refuelling on lined, bunded pads with drip trays; collect and manage all runoff as dirty water. • Maintain spill response equipment at refuelling points; train staff quarterly. • Implement a hazardous substances procedure compliant with the National Water Act and the National Environmental Management Act.	3	1	Low
Decommissioning of diesel/oil facilities – tank removal and rehabilitation	Residual contamination from dismantled tanks, pipelines, and bunds may leach post closure.		Decommissioning	3	3	Medium	• Drain and gas-free tanks; remove tanks, pipelines, and bund liners; manage residues as hazardous waste. • Undertake soil screening and confirmatory laboratory analysis; excavate contaminated soils and treat or dispose accordingly. • Backfill and compact excavations; re-profile, place topsoil, and establish vegetation; monitor for settlement and erosion.	2	1	Low
Erosion control and stormwater management	Disturbed soils may erode, destabilising slopes and increasing sediment load in surface water.		Operational	4	3	High	• Implement and maintain the Stormwater Management Plan, including clean water diversions and dirty water containment. • Install erosion controls (for example grassed swales, rock rip-rap, gabions, check dams) at concentration points and outfalls. • Minimise unvegetated areas; undertake progressive rehabilitation; mulch and hydroseed steep or erodible areas.	2	2	Low

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated			Management and Mitigation Measures	Significance If Mitigated		
				Probability	Magnitude	Significance		Probability	Magnitude	Significance
							• Inspect after rainfall events exceeding twenty millimetres in twenty-four hours; repair erosion immediately.			
Decommissioning of disturbed areas – general rehabilitation	Poorly rehabilitated areas may erode, affecting water quality and stability.		Decommissioning	3	2	Medium	• Rip compacted areas to at least three hundred millimetres; re-grade to blend with natural topography and achieve free drainage. • Replace stockpiled topsoil of adequate thickness; apply ameliorants based on soil tests; seed with indigenous species and apply mulch. • Install temporary erosion and sediment controls until vegetation is established; inspect after storm events. • Monitor vegetation cover and stability for three growing seasons; undertake infill seeding and repairs where needed.	2	1	Low
Operation of shaft infrastructure, TSFs, evaporation dams, and associated stormwater systems	Altered hydrology, seepage of sulphates/salts, bank erosion, alien vegetation invasion, reduced habitat quality in Boschluis Spruit valley-bottom wetland and adjacent seep wetlands; salinisation and biodiversity loss in depressional wetlands.	Wetlands (Boschluis Spruit valley-bottom, seep, and depressional wetlands)	Operational	4	3	High	• Maintain and implement comprehensive Stormwater Management Plan to separate clean and dirty water. • Line or upgrade TSFs/evaporation dams to minimise seepage. • Implement seepage interception drains and monitoring boreholes near wetlands. • Regularly monitor wetland water quality, vegetation condition, and erosion features. • Alien invasive species control programme (*Tamarix, Opuntia*). • Progressive rehabilitation of disturbed areas with indigenous wetland species.	2	2	Low
Decommissioning of TSFs, WRDs, evaporation dams, and supporting shaft infrastructure	Residual contamination and seepage (sulphates, chlorides, metals) may degrade Boschluis Spruit valley-bottom wetlands; sedimentation, reduced groundwater discharge in seep wetlands; depressional wetlands risk ongoing degradation if evaporation dams are not rehabilitated.		Decommissioning	4	3	High	• Cap and reshape TSFs with ≥500 mm soil and vegetate with indigenous wetland-compatible species. • Re-profile WRDs and stabilise slopes; apply stormwater diversions to reduce erosion and sediment loads. • Excavate and neutralise contaminated sediments from evaporation dams, breach walls to restore free-draining conditions, and rehabilitate as wetlands where possible. • Long term groundwater and surface water monitoring for ≥5 years post closure. • Active alien invasive species control and biodiversity rehabilitation programmes in wetlands. • Integration of wetlands into ecological corridors as part of closure land use planning.	2	2	Low
Mining operations, construction and maintenance of shaft infrastructure, TSFs, WRDs, evaporation dams, and haul roads	Loss and fragmentation of natural vegetation including Endangered Vaal-Vet Sandy Grassland; alteration of riparian zones and wetland margins; decline in veld quality due to overgrazing; displacement of climax grass species such as *Themeda triandra* (Red Grass) by disturbance-tolerant taxa; spread of invasive alien plants (e.g. *Tamarix ramosissima* – Salt Cedar; *Opuntia ficus-indica* – Prickly Pear).	Flora (grassland, riparian, wetland vegetation)	Operational	5	4	High	• Map and designate intact climax grasslands, riparian zones, and wetland buffers as high sensitivity areas protected from further disturbance. • Implement alien invasive clearing programme targeting *Tamarix ramosissima* and *Opuntia ficus-indica*. • Introduce grazing management plans to prevent overgrazing and veld degradation. • Rehabilitate disturbed areas progressively with indigenous grassland species. • Protect Conservation Important (CI) species (e.g. *Boophone disticha, Crinum bulbispermum, Eucomis autumnalis, Hypoxis hemerocallidea, Brunsvigia* spp.) through propagation, relocation if needed, and education to prevent unsustainable harvesting. • Monitor vegetation trends and rehabilitation success through long term biodiversity monitoring programmes.	2	2	Low
Decommissioning of mining infrastructure (shafts, plants, TSFs, WRDs, roads, evaporation dams, salvage yards)	Residual soil contamination, poor revegetation success, and spread of invasive alien species may limit recovery of floral communities. Inadequate rehabilitation could result in long term biodiversity loss, erosion, and failure to re-establish CI species.		Decommissioning	4	3	High	• Implement closure objectives focusing on restoring grasslands, riparian corridors, and wetland buffers with indigenous species. • Apply soil amelioration, re-topsoiling, and erosion control to promote revegetation success. • Actively propagate and reintroduce CI species into suitable rehabilitated habitats.	2	2	Low

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated			Management and Mitigation Measures	Significance If Mitigated		
				Probability	Magnitude	Significance		Probability	Magnitude	Significance
							• Integrate ecological corridors into the closure land use plan to restore connectivity across the landscape. • Maintain long term monitoring (≥5 years) of rehabilitation success, alien invasive spread, and biodiversity persistence. • Engage local communities in the stewardship of culturally significant species used in traditional medicine, ensuring sustainable use post-mining.			
Mining operations, shaft and plant activities (noise, lights, traffic, habitat disturbance)	Disturbance and displacement of fauna due to continuous noise, vibration, dust, and light. Loss of habitat connectivity for grassland and wetland-dependent species.	Fauna (mammals, birds, amphibians, reptiles, invertebrates)	Operational	4	3	High	• Restrict noisy operations to daytime where feasible. • Implement biodiversity monitoring programme with focus on CI species (e.g., African Grass-owl, Black-footed Cat, Giant Bullfrog). • Maintain ecological corridors between grasslands, wetlands, and riparian zones. • Apply speed limits and install fauna crossing signage to reduce vehicle collisions. • Control lighting to reduce nocturnal faunal disturbance.	2	2	Low
Wetland and pan interactions with mine infrastructure (effluent, seepage, altered flow)	Degradation of wetland and pan habitats supporting amphibians, waterbirds, and invertebrates. Reduced breeding success of Giant Bullfrog and migratory flamingos.	Fauna (wetland and aquatic species)	Operational	4	4	High	• Maintain clean/dirty water separation (GN 704 compliance). • Regular biomonitoring of amphibians and aquatic invertebrates in pans/wetlands. • Implement alien vegetation control (e.g., *Tamarix ramosissima, Opuntia ficus-indica*). • Enhance buffers around wetlands to protect habitats.	2	2	Low
Decommissioning of shaft, plant, TSFs and WRDs (demolition, reshaping, rehabilitation)	Short-term disturbance and displacement of fauna from closure activities (noise, dust, demolition). Risk of residual contamination and habitat fragmentation if rehabilitation is not effective.	Fauna (general assemblage and CI species)	Decommissioning	3	3	Medium	• Implement phased rehabilitation of disturbed areas with indigenous species (grasslands, riparian vegetation). • Remove contaminated materials and decontaminate soils. • Shape, rip and revegetate footprints of infrastructure. • Control alien invasive species during rehabilitation. • Maintain post closure biodiversity monitoring for ≥5 years.	2	2	Low
Post closure wetlands, pans, and rehabilitated grasslands	Long term residual impacts if seepage or poor rehabilitation results in ongoing wetland degradation and habitat loss. Risk to sensitive species such as Giant Bullfrog and African Grass-owl.	Fauna (wetland, grassland and migratory species)	Decommissioning	4	4	High	• Prioritise rehabilitation of wetlands and riparian corridors. • Establish long term monitoring of faunal communities in rehabilitated habitats. • Engage local stakeholders to support conservation of CI species and restrict unsustainable harvesting of medicinal plants. • Integrate mine rehabilitation into broader ecological corridor initiatives.	2	2	Low
Demolition and dismantling of smelting and processing facilities	Demolition dust, disturbed contaminated soils, release of volatile compounds and trace metals. Dust dispersion into surrounding environment, affecting health and ecosystems.	Air quality; soils; communities	Decommissioning	4	3	High	• Apply strict dust suppression (water spraying, dust screens, wind breaks). • Decontaminate salvageable equipment prior to removal. • Remove hazardous waste and contaminated materials to licensed facilities. • Excavate and bioremediate hydrocarbon-contaminated soils. • Maintain clean/dirty water separation during demolition. • Establish vegetation on exposed soils post closure. • Post closure air quality monitoring ≥5 years.	2	2	Low
TSFs and waste rock dumps (WRDs)	Fugitive dust emissions containing silica, sulphates, and trace metals. Long term dispersion may affect communities, agriculture, and ecosystems.	Air quality; soils; vegetation; communities	Operational	4	3	High	• Maintain TSF freeboard below 0.8 m. • Progressive rehabilitation of TSFs and WRDs (capping, vegetation). • Routine inspections and maintenance of dust suppression. • Regular leachate testing of tailings material. • Codes of Practice audits for mine residue facilities.	2	2	Low
Decommissioning of TSFs and WRDs – reshaping, capping, and rehabilitation	Dust generation during earthmoving, profiling, and capping. Long term risk of residual dust dispersion if rehabilitation fails.	Air quality; soils; vegetation	Decommissioning	5	4	High	• Cap TSFs with ≥500 mm soil cover. • Shape and stabilise slopes ≤1:4. • Apply lime or soil amendments where required. • Establish indigenous vegetation. • Implement stormwater diversion.	3	2	Medium

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated			Management and Mitigation Measures	Significance If Mitigated		
				Probability	Magnitude	Significance		Probability	Magnitude	Significance
							• Long term monitoring and maintenance of rehabilitated surfaces.			
General mining and vehicle activities (haul roads, equipment, blasting)	Dustfall from haul roads, vehicles, and blasting. Localised air quality deterioration; occupational and community health risks.	Air quality; human health; vegetation	Operational	3	2	Medium	• Water spraying of haul roads and exposed areas. • Enforce speed restrictions. • Maintain vehicle fleets. • Cover loads during transport. • Provide personal protective equipment (PPE). • Routine air quality monitoring.	2	1	Low
Decommissioning of vehicle yards and roadways	Dust emissions during road ripping, rehabilitation, and demolition. Hydrocarbon-contaminated soils may release vapours.	Air quality; soils	Decommissioning	3	2	Medium	• Excavate and remediate contaminated soils. • Dust suppression during rehabilitation. • Reapply topsoil and vegetate. • Monitor air quality during demolition.	2	1	Low
Operation of ventilation fans, conveyor systems, Gold Plant machinery, and mobile equipment	Continuous operational noise may increase ambient noise levels at nearby rural and residential receptors, disturbing community wellbeing and sensitive fauna (e.g., African Grass-owl, raptors).	Noise environment (communities and fauna)	Operational	4	3	High	• Conduct regular noise monitoring as per SANS 10103 and SANS 10328. • Install noise barriers/enclosures around major sources. • Replace or upgrade older machinery with quieter alternatives. • Use vibration isolation and damping materials. • Limit noisy activities during sensitive night-time hours. • Maintain equipment to reduce mechanical noise. • Implement employee and community awareness programmes on noise impacts.	2	2	Low
Decommissioning of processing plant, shafts, and infrastructure (demolition, dismantling, heavy vehicle use)	Short-term elevated noise levels from demolition equipment and vehicles may disturb communities and fauna.		Decommissioning	4	3	High	• Restrict demolition to daytime hours. • Fit machinery with silencers and sound-dampening materials. • Provide personal protective equipment to workers. • Create exclusion zones around noisy demolition activities. • Inform communities of demolition schedules to reduce disturbance. • Conduct post-decommissioning monitoring to confirm noise returns to baseline levels.	2	2	Low
Disturbance of identified heritage resources during mining operations (canal, reservoirs, Stone Age scatters, farmsteads, cemeteries)	Damage or destruction of archaeological sites, historical structures, and burial grounds; loss of cultural, historical, and scientific value.	Heritage (archaeologica l, historical, and cultural sites, including graves)	Operational	4	4	High	• Maintain legally required buffer zones around identified heritage sites. • Implement a Heritage Management Plan aligned with the National Heritage Resources Act, 1999 (Act 25 of 1999). • Train staff on heritage awareness and chance finds procedures. • Immediate reporting of heritage finds to heritage authorities. • Protect and fence sensitive areas such as cemeteries. • Apply dust and vibration control near heritage sites. • Conduct monitoring by heritage specialists during earthworks or expansion.	2	2	Low
Decommissioning activities including demolition of infrastructure, rehabilitation of disturbed areas, and earthmoving near heritage sites	Accidental disturbance, removal, or destruction of heritage features; exposure of unmarked graves; degradation of cultural landscapes.		Decommissioning	4	3	High	• Implement a Heritage Decommissioning Management Plan prior to closure. • Obtain required permits for alteration or removal of heritage resources from SAHRA. • Document, conserve, or relocate significant structures and artefacts where feasible. • Engage with affected communities regarding treatment of graves and culturally important sites. • Memorialisation of burial grounds to ensure long term cultural respect. • Monitoring by heritage specialists during demolition and rehabilitation. • Integrate heritage sites into post-mining land use planning.	2	2	Low
Operation of Beatrix 4 Shaft (employment, procurement,	Job creation and income stability for local households. Strengthening of SMEs through procurement. Support for municipal revenue and service delivery. Risks include	Socio-economic conditions,	Operational	3	3	Medium +	• Implement local employment and procurement policies prioritising nearby communities.	5	4	High+

Activities	Potential Impact	Aspects Affected	Phase	Significance If Unmitigated			Management and Mitigation Measures	Significance If Mitigated		
				Probability	Magnitude	Significance		Probability	Magnitude	Significance
municipal contributions, community services)	economic dependency on mining, strain on housing/healthcare/education services, and social challenges such as crime and inequality.	livelihoods, municipal services, social cohesion					• Invest in training and skills development to improve employability and resilience. • Continue corporate social responsibility programmes focusing on education, healthcare, and infrastructure. • Regular engagement with communities and municipalities to manage expectations and align with development priorities. • Develop partnerships to diversify the local economy beyond mining.			
Closure and decommissioning of Beatrix 4 Shaft (loss of operations, dismantling, rehabilitation)	Large-scale job losses and reduced household income. Loss of municipal revenue. Economic downturn for service sectors. Risks of out-migration, crime, social instability, and erosion of social cohesion. Opportunity for alternative land uses and sustainable livelihoods if closure is managed proactively.	Socio-economic conditions, livelihoods, municipal services, community stability	Decommissioning	5	5	High	• Implement social transition programmes for workers and families. • Provide retraining and reskilling opportunities aligned with alternative sectors (e.g. renewable energy, agriculture, services). • Develop closure plans in alignment with municipal integrated development plans and regional economic frameworks. • Foster partnerships with government and private sector to support diversification projects. • Establish social safety nets and targeted support for vulnerable groups. • Use rehabilitation to restore land for agricultural or alternative productive use.	3	3	Medium

14 SUMMARY OF SPECIALIST REPORTS

The findings of each specialist study are summarised in Table 14-1 below. The table outlines the list of additional specialist investigations undertaken[46], the recommendations provided by the respective specialists, whether these recommendations have been incorporated into the Basic Assessment Report, and the section of the report where their inclusion is reflected. This summary provides a clear link between specialist input and the impact assessment, ensuring transparency and traceability in how recommendations have been addressed.

Table 14-1: Summary of the Specialist Studies

List of Studies Undertaken	Recommendations of Specialist Reports	Specialist Recommendations that have been Included in the BAR (Mark with an X Where Applicable)	Reference to Applicable Section of Report Where Specialist Recommendations have been Included
Hydrogeological Study for Beatrix Mine, compiled by SRK Consulting (SRK , 2019) attached in Appendix B.	• Monitoring Network Expansion ○ Increase the number of downgradient boreholes, especially between the northern evaporation dams and the Boschluis Spruit, to provide early warning of plume migration. ○ Install continuous loggers (EC, water level, temperature) in key boreholes for real-time tracking and improved trend analysis. ○ Maintain up-gradient background boreholes to ensure baseline conditions are consistently measured. • Trigger Action Response Plan (TARP) ○ Develop and implement a TARP to set threshold values for water levels, EC, sulphate, and uranium. ○ Ensure that exceedances trigger immediate investigations and, where necessary, remedial measures to prevent uncontrolled impacts. • Source Control ○ Reduce seepage from tailings storage facilities (TSFs) and evaporation dams through improved lining systems, leak detection, and seepage interception drains. ○ Strengthen containment around waste rock dumps and return water dams to prevent infiltration into shallow aquifers. • Pathway Management ○ Consider installing hydraulic containment systems (e.g., abstraction boreholes or pumping galleries) to control the migration of contaminant plumes.	X	Section 13.

[46] The table outlines the list of additional specialist investigations undertaken since the approval of the EA.

List of Studies Undertaken	Recommendations of Specialist Reports	Specialist Recommendations that have been Included in the BAR (Mark with an X Where Applicable)	Reference to Applicable Section of Report Where Specialist Recommendations have been Included
	○ Evaluate the use of permeable reactive barriers or passive treatment trenches in areas where plumes are predicted to intersect with the Boschluis Spruit. • Receptor Protection ○ Establish and maintain buffer zones along the Boschluis Spruit to reduce risks of direct discharge into valley-bottom wetlands. ○ Implement ecological monitoring of the Boschluis Spruit wetlands to detect and respond to early signs of degradation. ○ Engage with local land users relying on shallow boreholes to ensure awareness and contingency measures for potential groundwater impacts. • Closure and Post Closure Planning ○ Anticipate groundwater rebound and possible decant after mine closure. ○ Incorporate active water treatment technologies (such as sulphate-reducing bioreactors or pump and treat systems) into closure strategies. ○ Ensure financial provision for long term water quality management is built into closure cost estimates. ○ Model post closure scenarios regularly as more monitoring data becomes available to refine risk assessments.		
Biodiversity Baseline Assessment Report, Section D: Wetland Assessment, compiled by NSS (NSS, 2016b) attached in Appendix C.	• Habitat Protection and Buffers ○ Grassland and wetland habitats should be considered of high conservation importance as they support the majority of detected and potentially occurring Conservation Important (CI) species. ○ Buffers should be implemented around sensitive habitats, particularly wetland systems and grassland patches where species such as the African Grass-owl, Giant Bullfrog, and Giant Dragon Lizard were recorded or are highly likely to occur. • Targeted Species Surveys ○ A dedicated survey is recommended to determine the extent and population size of the Vulnerable Giant Dragon Lizard (*Smaug giganteus*) population in the Wolvepan/Rietpan evaporation complex. ○ Additional long term monitoring should be undertaken for threatened mammals (e.g., Black-footed Cat, Brown Hyaena, Southern African Hedgehog), birds (African Marsh-harrier, Secretarybird, Lanner Falcon, Blue Crane, Greater and Lesser Flamingos), and amphibians (Giant Bullfrog). • Management of Threatened Species	X	Section 13.

List of Studies Undertaken	Recommendations of Specialist Reports	Specialist Recommendations that have been Included in the BAR (Mark with an X Where Applicable)	Reference to Applicable Section of Report Where Specialist Recommendations have been Included
	○ Specific management measures must be put in place to protect detected and potential CI species, including the Aardvark, Natal Long-fingered Bat, African Grass-owl, and Maccoa Duck. ○ Seasonal monitoring of migratory or nomadic species, such as Lesser Kestrels and flamingos, should be conducted. • Mitigation of Potential Threats ○ Activities that could disturb or destroy CI species' habitats (e.g., further development near evaporation pans or grassland patches) should be carefully managed or avoided. ○ Measures to reduce secondary poisoning of birds of prey and waterbirds should be implemented, particularly in response to reports of agrochemical poisoning of "pest" species in the region. • Monitoring and Adaptive Management ○ Monitoring programmes should be established for faunal populations, particularly in grassland and wetland habitats. ○ Adaptive management should be applied, whereby findings from ongoing monitoring inform adjustments in mine planning, operational controls, and rehabilitation programmes. • Collaboration and Stewardship ○ Partnerships with organisations such as the Endangered Wildlife Trust should continue, particularly for species like the Giant Dragon Lizard. ○ Biodiversity stewardship programmes could be used to formalise conservation commitments for sensitive habitats on and around the mine lease area.		
Biodiversity Baseline Assessment Report, Section C: Faunal Assessment, compiled by NSS (NSS, 2016c) attached in Appendix D.	• Biodiversity and Species Conservation ○ Commit to conserving biodiversity features of highest provincial priority, including wetlands, pans, and habitats supporting threatened species such as the Giant Bullfrog (*Pyxicephalus adspersus*), African Grass-owl (*Tyto capensis*), and Giant Dragon Lizard (*Smaug giganteus*). ○ Encourage custodianship of local Conservation Important biodiversity by lessees and landholders, with recognition and incentives, in line with Endangered Wildlife Trust custodianship guidelines. • Fire and Veld Management ○ Prevent and extinguish fires in all sensitive habitats including wetlands, riparian zones, grasslands, and alien bush clumps until a specialist veld condition assessment is completed.	X	Section 13.

List of Studies Undertaken	Recommendations of Specialist Reports	Specialist Recommendations that have been Included in the BAR (Mark with an X Where Applicable)	Reference to Applicable Section of Report Where Specialist Recommendations have been Included
	○ Reconfigure and maintain fire breaks by using natural drainage channels, roads, and controlled cool burns instead of mowing or herbicides. ○ Engage with the national "Working on Fire" and "FireWise Communities" programmes to integrate community fire management, awareness, and risk reduction. • Waste and Energy Management ○ Collaborate with the DWS "Working on Waste" programme to establish a community-based waste management system, including domestic waste collection, recycling centres, composting facilities, and Integrated Waste Management Plans. ○ Explore opportunities with the "Working for Energy" programme to generate renewable energy from biomass, invasive alien plants, biofuels, mini-grids, solar power, and micro-hydro systems. • Stakeholder Engagement and Awareness ○ Orchestrate biodiversity awareness programmes, including open days, workshops, school outreach (e.g., mini-SASS aquatic biomonitoring events), and voluntary surveys such as Big Birding Days and Frogging Nights. ○ Develop effective communication networks with land occupants and stakeholders through WhatsApp, SMS, e-mail groups, pamphlets, and conspicuous signage. ○ Provide regular updates to stakeholders on biodiversity issues and collaborate on adaptive veld and rangeland management. • Monitoring and Adaptive Management ○ Monitor veld condition regularly to evaluate the impacts of grazing and fire, with annual internal evaluations, external auditing, and a comprehensive review every five years. ○ Incorporate all Biodiversity Management and Action Plan recommendations into the mine's Environmental Management Programme to ensure legal compliance and accountability.		
Air Quality Management Plan (Sibanye, 2016)	• A comprehensive ambient air quality monitoring programme must be established and maintained. This programme should include the monitoring of particulate matter (both PM_{10} and $PM_{2.5}$), dust fall, alpha quartz, heavy metals, and volatile organic compounds. • All operations must ensure full compliance with the requirements of the National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) as well as the conditions of the Atmospheric Emission Licences. • Abatement equipment such as bag filters and scrubbers must be installed and properly maintained at furnaces, kilns, assay laboratories, and acid tanks in order to control emissions effectively. • Vegetation establishment and surface crusting programmes must be implemented on slimes dams to reduce the potential for dust generation.	X	Section 13.

<table>
<tr><th>List of Studies Undertaken</th><th>Recommendations of Specialist Reports</th><th>Specialist Recommendations that have been Included in the BAR (Mark with an X Where Applicable)</th><th>Reference to Applicable Section of Report Where Specialist Recommendations have been Included</th></tr>
<tr><td></td><td>Boiler emissions and emissions from the transport of materials must be regularly maintained, managed, and monitored to prevent air quality deterioration.
Climate change response measures must be incorporated into operations, including the implementation of energy recovery initiatives and efficiency projects aimed at reducing carbon intensity.
Stakeholder engagement must take place on a regular basis, and there must be transparent disclosure of any exceedances. This includes the submission of accurate reports to the National Atmospheric Emissions Inventory System and the communication of results to regulatory authorities and affected parties.</td><td></td><td></td></tr>
<tr><td>Heritage Audit undertaken by PGS Heritage (Pty) Ltd. (PSG, 2017), attached in Appendix E.</td><td>Heritage Management Policy
A Heritage Management Policy must be implemented to provide guidance on the protection, conservation, and mitigation of heritage resources identified within the Beatrix mining area.
This policy should outline actions required when construction, mining, or related activities could affect heritage resources.
Mitigation Measures for Heritage Resources
Any heritage site older than 60 years, including historical farmsteads and outbuildings, may not be altered, demolished, or destroyed without a permit from the South African Heritage Resources Agency (SAHRA) or the Provincial Heritage Resources Authority.
Archaeological sites, structures, or objects older than 100 years are defined as archaeological resources and require permits prior to any disturbance.
Graves and Burial Grounds
Graves and burial grounds identified (including unmarked graves likely associated with historic homesteads and worker compounds) must be treated as highly significant and managed according to the National Heritage Resources Act, 1999 (Act No. 25 of 1999) and relevant provincial legislation.
Any relocation of graves must follow formal procedures, including public participation and approval by the relevant heritage authority.
Conservation of High Significance Sites
Sites of high or medium significance, such as the Wolwepan farmstead and its associated cemetery, must be conserved in situ where possible.
No-go or buffer zones should be created around sensitive heritage sites.
Recording and Documentation</td><td>X</td><td>Section 13.</td></tr>
</table>

List of Studies Undertaken	Recommendations of Specialist Reports	Specialist Recommendations that have been Included in the BAR (Mark with an X Where Applicable)	Reference to Applicable Section of Report Where Specialist Recommendations have been Included
	○ Sites of medium or lower significance that cannot be conserved should be mapped, recorded, and documented prior to any disturbance or destruction. ○ This includes photographic records, GPS logging, and controlled sampling where appropriate. • Further Specialist Studies ○ Additional fieldwork and heritage assessments must be undertaken if new areas are added to the mining property beyond those covered in the 2017 survey. ○ Continuous monitoring is recommended in undisturbed sections where there is a likelihood of uncovering archaeological remains (such as Stone Age sites). • Legislative Compliance ○ All activities impacting heritage resources must comply with the National Heritage Resources Act, 1999 (Act No. 25 of 1999) and its relevant sections on archaeological sites, palaeontological sites, historical structures, and burial grounds. ○ Developers must obtain permits prior to any intervention.		

15 ENVIRONMENTAL IMPACT STATEMENT

15.1 Summary of the Key Findings of the Environmental Impact Assessment

15.1.1 Topography

15.1.1.1 Operational Phase

During the operational phase, mining infrastructure such as WRDs, TSFs, evaporation dams, and associated surface infrastructure will cause localised alterations to the natural topography. While the broader undulating plains of the Free State highveld will remain largely unchanged, permanent landform modifications are expected at engineered waste disposal facilities. These changes may contribute to visual intrusion, erosion risk, and long term alterations of surface drainage patterns.

With the implementation of mitigation measures, including the development of a Stormwater Management Plan, routine inspection and maintenance of trenches, berms, and drains, and progressive shaping and rehabilitation of disturbed land, the significance of the impact is reduced from high to medium. These interventions will minimise erosion, support visual integration into the surrounding landscape, and reduce long term landform instability.

15.1.1.2 Decommissioning Phase

During the decommissioning phase, the cessation of active operations will eliminate the creation of new surface disturbances. However, existing TSFs, WRDs, and evaporation dams will remain as permanent modifications to the topography. Rehabilitation activities, including re-contouring of disturbed areas, stabilisation of slopes, and revegetation with indigenous species, will be critical in reducing erosion potential and promoting long term visual and ecological integration with the surrounding environment.

Residual impacts on topography will persist due to the irreversible presence of large engineered structures. Nonetheless, through effective rehabilitation and closure planning, these impacts are expected to stabilise and remain within acceptable environmental limits. The significance of decommissioning impacts is rated as Medium, reflecting their long term but manageable nature.

15.1.2 Soils

15.1.2.1 Operational Phase

During the operational phase, soils are directly impacted by the construction and operation of slimes dams, WRDs, evaporation dams, and disposal sites. Localised sterilisation occurs within mine infrastructure footprints, while seepage from evaporation dams poses risks of long term soil salinisation. Sandy upland soils are highly erodible when disturbed, and valley-bottom alluvial soils are vulnerable to gulley erosion. Without mitigation, impacts are of medium significance. Mitigation during operations includes stripping and stockpiling topsoil, progressive rehabilitation using stored soils, and ongoing monitoring of soil salinity and erosion.

During operations, soils are exposed to potential contamination from hydrocarbon leaks (e.g., fuel storage, haul trucks, workshops), chemical storage and handling, and general/domestic waste disposal. If unmanaged, these sources can lead to hydrocarbon residues, heavy metal accumulation, or leachate, resulting in soil contamination, reduced fertility, and risks to groundwater. Such impacts are medium to high significance depending on the scale of spillage. Mitigation includes bunding and lining of chemical/hydrocarbon storage areas, strict waste segregation, use of drip trays and spill kits, designated hazardous waste facilities, and continuous soil quality monitoring. With mitigation, residual impacts are reduced to low to medium significance.

15.1.2.2 Decommissioning Phase

In the decommissioning phase, residual risks remain around TSFs, WRDs, and evaporation dams. Poorly drained sodic soils and contaminated footprints may perpetuate salinity and erosion risks if unmanaged. Closure objectives require creating a safe, stable, and non-polluting post-mining landscape. Accordingly, mitigation will focus on re-profiling disturbed areas, applying lime or other ameliorants, reinstating topsoil to a minimum depth of 300–500 mm, and establishing indigenous vegetation to stabilise soils. These measures reduce the impact from medium to low significance and support the partial recovery of soil function, particularly for grazing use.

At closure, residual chemical and hydrocarbon contamination may persist in soils beneath workshops, fuel bays, process plants, and waste handling sites. If unmanaged, these “hotspots” pose a long term risk to rehabilitation success and land capability, with contaminants potentially leaching into soil and groundwater. Closure measures include removal of contaminated soils, disposal at licensed hazardous facilities, bioremediation of hydrocarbon-impacted areas, demolition of contaminated infrastructure to 1 m depth, and capping/amelioration of impacted soils. These measures align with the closure objective of establishing a safe, stable, and non-polluting post-mining environment. With proper implementation, residual impacts can be reduced from medium–high to low–medium significance.

15.1.3 Land Capability

15.1.3.1 Operational Phase

Operational mining sterilises land capability within infrastructure footprints, particularly at TSFs, WRDs, and evaporation dams, while the majority of the surrounding landscape remains suitable for maize production and grazing. Without mitigation, land capability impacts are of high significance. During operations, mitigation includes progressive rehabilitation, erosion and dust control, and reapplication of stored topsoil to maintain potential for post-mining use.

15.1.3.2 Decommissioning Phase

At closure, land capability remains constrained by permanent mine infrastructure. Without intervention, these areas would remain unsuitable for agriculture. Closure measures include re-contouring WRDs and TSFs to stable slopes (1:3 for dumps, 1:4 for TSFs), applying a minimum of 500 mm of soil cover, and establishing vegetation. These actions improve stability and restore areas to grazing potential. With mitigation, impacts reduce from high to medium significance, aligned with the closure objective of developing a functional post-mining landscape that supports agricultural practices where feasible.

15.1.4 Land Use

15.1.4.1 Operational Phase

Mining operations permanently transform land use within the project footprint, sterilising agricultural land for crop and livestock production. TSFs, WRDs, and solid waste disposal areas represent a permanent loss of land for agricultural purposes, while evaporation dams may partially recover over time to support grazing. Without mitigation, land use impacts are of high significance. Engagement with the Department of Agriculture and rehabilitation of disturbed areas can reduce residual impacts to medium significance.

15.1.4.2 Decommissioning Phase

During decommissioning, sterilised land uses will persist, but closure planning allows for partial reintegration of land into agriculture and grazing. Rehabilitated footprints, reshaped slopes, and vegetated areas may provide limited grazing capacity, while ecological corridors and riparian zones offer biodiversity opportunities. Long term stakeholder consultation ensures that post-mining land use aligns with community and regional planning objectives. With mitigation, impacts reduce from high to medium significance, ensuring that some beneficial use of the land is retained post closure.

15.1.5 Groundwater

15.1.5.1 Operational Phase

Mining activities, particularly tailings storage, evaporation dams, WRDs, and process water circuits, are already contributing to groundwater contamination. Seepage has elevated sulphate and chloride concentrations in downgradient boreholes, with EC values exceeding baseline ranges. Contaminant plumes are migrating within the fractured Karoo aquifers and perched aquifers towards the Boschluis Spruit. While impacts remain relatively localised, modelling predicts further plume expansion during the LoM, increasing risks to sensitive wetland systems. Without robust mitigation, groundwater quality deterioration will have regional, long term, and high significance consequences.

15.1.5.2 Decommissioning Phase

Post closure groundwater rebound of up to 7 m is expected as dewatering ceases, raising the risk of decant into valley-bottom wetlands such as the Boschluis Spruit. Residual contamination from TSFs, evaporation dams, and waste facilities will persist for decades. Uranium mobilisation is anticipated under changing redox conditions, adding to the long term risk profile. These impacts are definite, regional in extent, and long term with medium to high significance. Proactive closure measures such as interception drains, active treatment, and long term monitoring are essential to protect water users and ecological receptors.

15.1.6 Surface Water

15.1.6.1 Operational Phase

Surface water resources in the Beatrix 4 Shaft area are affected by two primary pathways:

Seepage from Mining Residue Facilities

Seepage from TSFs, WRDs, and evaporation dams elevates EC, sulphate, and chloride concentrations in downstream compliance points. While catchment yield reduction is negligible (<0.001%), water quality deterioration is significant. The Boschluis Spruit, which is Moderately Modified (PES C), is particularly vulnerable, and further contamination places aquatic ecosystems at risk. Without mitigation, impacts are definite, regional in extent, long term, and high significance.

Chemicals, Hydrocarbons, and Waste

Surface water is also at risk from operational handling of fuels, lubricants, chemicals, and waste. Spillages from workshops, fuel storage, and waste facilities, coupled with stormwater runoff, can introduce hydrocarbons, heavy metals, and other pollutants into local streams and wetlands. This contamination increases biochemical oxygen demand, reduces water quality, and may cause toxic effects to aquatic species. Without controls, impacts are probable, site to regional, medium-term, and high significance. With mitigation measures, residual impacts reduce to medium significance for seepage and low–medium significance for chemicals/hydrocarbons/waste.

15.1.6.2 Decommissioning Phase

During closure, surface water risks remain, though sources shift in nature:

Residual Seepage

Even as contaminated water volumes decline due to aquifer drawdown, seepage from TSFs, WRDs, and evaporation dams persists. Rebound in groundwater levels may also lead to discharge into wetlands and streams, carrying sulphates, chlorides, and uranium. Without controls, impacts remain definite, site to regional, long term, medium–high significance.

Chemicals, Hydrocarbons, and Waste

Decommissioning activities such as demolition of workshops, dismantling of fuel bays, and removal of process facilities pose short-term but acute risks. Runoff from demolition and improper handling of hazardous waste (e.g., oils, chemicals, and asbestos) could result in localised contamination of surface water systems. Without intervention, impacts are definite, site-specific to local, medium-term, medium significance.

With proper implementation, residual seepage impacts reduce to medium significance and chemical/hydrocarbon/waste-related impacts reduce to low significance, aligning with closure objectives of a safe, non-polluting, and stable rehabilitated landscape.

15.1.7 Wetlands

15.1.7.1 Operational Phase

During the operational phase, the Boschluis Spruit valley-bottom wetland and associated seep systems receive stormwater runoff, seepage from TSFs, and discharges from evaporation dams. These inputs alter the natural hydrological regime, elevating sulphate and salinity levels and leading to bank erosion, rubble dumping, and the spread of alien invasive species such as tamarisk (*Tamarix* spp.) and Prickly Pear (*Opuntia* spp.). The depressional wetlands (including natural pans converted to evaporation ponds) show severely reduced ecological integrity due to salinisation, toxicant accumulation, and habitat loss. While the wetlands continue to provide important ecosystem services such as streamflow regulation, sediment trapping, and toxicant assimilation, their capacity is being eroded. The Boschluis Spruit valley-bottom wetland, rated as Moderately Modified (PES Category C), remains the most sensitive receptor, with medium to high significance impacts likely if stormwater and seepage management are not maintained.

15.1.7.2 Decommissioning Phase

In the decommissioning phase, the potential for impacts on wetlands persists through residual contamination, altered hydrology, and the long term stability of rehabilitated TSFs, WRDs, and evaporation dams. Poorly managed closure activities could cause increased sediment loads, acid drainage, or the mobilisation of sulphates, chlorides, and trace metals into the Boschluis Spruit and its valley-bottom wetlands. Seep wetlands may remain vulnerable to reduced groundwater discharge and soil compaction, while depressional wetlands risk continued degradation if evaporation ponds are not rehabilitated. Without targeted rehabilitation including capping of TSFs, reshaping of WRDs, stormwater diversion, and alien invasive species control, the EIS of these wetlands (assessed as Moderate to High for valley-bottom systems) could decline further. Post closure monitoring and long term management are essential to safeguard residual wetland functionality and ecological services.

15.1.8 Flora

15.1.8.1 Operational Phase

The Beatrix 4 Shaft area falls within the Grassland Biome, dominated by the Endangered Gh10 Vaal-Vet Sandy Grassland, with additional azonal types such as Highveld Alluvial Vegetation, Clay Grassland, and Salt Pans. Operational mining activities, including shaft infrastructure, TSFs, evaporation dams, and WRDs, have already fragmented and transformed large portions of this environment. Remaining climax grasslands and riparian zones continue to function as biodiversity refuges but are under pressure from habitat loss, overgrazing, altered hydrology, and the spread of invasive alien plants such as *Tamarix ramosissima* (Salt Cedar) and *Opuntia ficus-indica* (Prickly Pear).

The persistence of CI species including *Boophone disticha* (Bushman's Poison Bulb), *Crinum bulbispermum* (Orange River Lily), *Eucomis autumnalis* (Pineapple Lily), *Hypoxis hemerocallidea* (African Potato), and *Brunsvigia* spp. (Candelabra Flower), indicates the ecological and cultural value of the landscape. However, these slow-growing taxa are highly vulnerable to soil disturbance, unsustainable harvesting, and habitat degradation. Continued operations pose risks of further habitat fragmentation, veld quality reduction through overgrazing, and irreversible biodiversity loss if not carefully managed.

15.1.8.2 Decommissioning Phase

During closure and decommissioning, the removal of infrastructure and rehabilitation of disturbed land presents opportunities to restore floral integrity, but also carries risks of soil erosion, poor revegetation success, and further spread of invasive alien species if rehabilitation is not adequately implemented. Residual contamination from mine-affected soils and hydrological alterations may continue to constrain the regeneration of grassland and wetland flora.

Closure objectives such as re-establishing a stable, non-polluting post-mining landscape—require focused rehabilitation of grasslands, riparian corridors, and pan systems using indigenous vegetation. Active propagation and reintroduction of CI species, combined with alien invasive clearing and long term monitoring, will be essential to restore ecological function and conserve biodiversity. By integrating these measures into closure planning, Sibanye Gold can contribute to regional conservation goals while ensuring that culturally significant plant species remain available to surrounding communities.

15.1.9 Fauna

15.1.9.1 Operational Phase

Mining operations and associated infrastructure at Beatrix 4 Shaft will continue to place pressure on faunal communities through habitat loss, disturbance, and fragmentation. Grassland transformation and wetland modification reduce the availability of intact habitat for ground-nesting birds, amphibians, and small mammals. Threatened species such as the African Marsh-harrier (*Circus ranivorus*), Secretarybird (*Sagittarius serpentarius*), African Grass-owl (*Tyto capensis*), Black-footed Cat (*Felis nigripes*), and Giant Bullfrog (*Pyxicephalus adspersus*) are particularly vulnerable. Noise, artificial lighting, vehicle traffic, and increased human activity may displace sensitive species, while water quality impacts from effluent discharges and dust deposition can alter wetland and pan habitats critical for amphibians and waterbirds. Invertebrates such as butterflies and dragonflies, which serve as ecological indicators, may show reduced diversity under continued disturbance. Although smaller generalist species like the Cape Ground Squirrel (*Xerus inauris*) and Yellow Mongoose (*Cynictis penicillata*) persist, overall ecological function and biodiversity resilience will decline without active management interventions.

15.1.9.2 Decommissioning Phase

Decommissioning activities such as demolition of infrastructure, rehabilitation of tailings and WRDs, and reshaping of disturbed areas—will result in short-term disturbance to faunal communities but also provide opportunities for ecological recovery. Poorly managed closure could leave contaminated soils, fragmented habitats, and residual artificial structures that continue to threaten faunal species through leaching pollutants and creating ecological traps. Wetlands and pans will remain critical habitats, particularly for amphibians such as the Giant Bullfrog (*Pyxicephalus adspersus*) and for migratory waterbirds. Grassland-dependent raptors and ground-nesting birds like the Secretarybird (*Sagittarius serpentarius*) will remain vulnerable to habitat degradation if rehabilitation is not effective. However, if closure objectives are properly implemented—such as restoring grassland mosaics, re-establishing ecological corridors, controlling alien invasive plants, and monitoring key CI species—faunal diversity and ecological functionality could gradually improve. Over the long term, rehabilitated habitats could again support threatened and indicator species, contributing to biodiversity stewardship in the Free State Grassland Biome.

15.1.10 Air Quality

15.1.10.1 Operational Phase

During the operational phase, Beatrix 4 Shaft contributes to air quality impacts through dust emissions, smelting and processing emissions, and potential fugitive releases from TSFs and WRDs. Key pollutants include particulate matter (PM_{10} and $PM_{2.5}$) and fugitive dust emissions from TSFs and waste facilities. Dustfall from TSFs and waste facilities, exacerbated during dry and windy conditions, poses risks to surrounding communities, agricultural land, and natural vegetation.

Alpha quartz (respirable crystalline silica) in dust also presents occupational and community health risks due to its carcinogenic properties. Without stringent controls, cumulative emissions may degrade air quality, increase respiratory health impacts, and affect sensitive receptors (e.g. communities, wetlands, and biodiversity corridors) downwind of the shaft complex.

15.1.10.2 Decommissioning Phase

During decommissioning, air quality impacts shift from continuous operational emissions to demolition-related dust, contaminated soil disturbance, and residual emissions from dismantling processing facilities and storage tanks. The removal of infrastructure, demolition of concrete and steel structures, and rehabilitation of TSFs and WRDs may release significant dust loads containing silica, sulphates, and trace metals.

Hydrocarbon residues and volatile compounds from decommissioned storage areas, workshops, and refuelling facilities could volatilise or be dispersed during demolition if not properly contained. Inadequate dust suppression during earthmoving and profiling of dumps and TSFs may increase fugitive dust generation, affecting workers and surrounding communities. If rehabilitation measures such as dust suppression, capping, and vegetation establishment are not effectively implemented, long term dust generation and particulate dispersion from rehabilitated landforms may persist.

Proactive mitigation—including dust suppression during demolition, removal of contaminated infrastructure, capping of TSFs and WRDs, and post closure air quality monitoring—is essential to ensure air quality risks are reduced to low significance post closure.

15.1.11 Noise

15.1.11.1 Operational Phase

Noise generated during the operational phase of the Beatrix operations is primarily associated with ventilation equipment, materials handling systems, light vehicle movements, and general mine-related activity. However, noise monitoring undertaken in May 2025 confirmed that ambient noise levels at all four monitoring locations remained within the permissible day and night rating levels prescribed by SANS 10103:2008 and the Free State Noise Control Regulations. Daytime noise levels ranged between 31.9 dBA and 49.9 dBA, while night-time levels ranged between 30.5 dBA and 37.8 dBA, reflecting low intensity rural acoustic conditions in which mine operational noise was largely inaudible or barely perceptible at receptor points. The dominant sound sources were found to be natural and agricultural in character, including birds, livestock and occasional passing vehicles, with no evidence of tonal, impulsive, or mechanically intrusive mine noise. Although current operations are fully compliant and pose no measurable noise nuisance to surrounding communities or ecological receptors, continued biennial monitoring, complaint-response procedures, and proactive equipment maintenance remain necessary to ensure early detection of any future changes in acoustic conditions and to maintain confidence among local landowners and stakeholders.

15.1.11.2 Decommissioning Phase

During decommissioning, noise impacts are anticipated to arise from the demolition of infrastructure, dismantling of processing facilities, use of heavy machinery, and increased vehicle activity. These activities are expected to generate short-term but elevated noise levels compared to routine operations. While impacts will be temporary and localised, there is potential for disturbance to nearby residential receptors and for disruption of fauna, particularly nocturnal and wetland-dependent species. With appropriate mitigation, including limiting noisy activities to daytime hours, applying sound-damping measures, maintaining equipment, and providing PPE to workers, noise impacts can be reduced to acceptable levels. Post-decommissioning, the cessation of mining and processing activities will result in a long term reduction of noise across the Beatrix 4 Shaft area, restoring the acoustic environment closer to its natural rural baseline.

15.1.12 Heritage

15.1.12.1 Operational Phase

During the operational phase of Beatrix 4 Shaft, potential impacts on heritage resources are primarily linked to ground disturbance, infrastructure expansion, and indirect effects such as vibration, dust deposition, and restricted access to heritage sites. Identified heritage resources in proximity to the shaft include historical structures (e.g., irrigation canal, reservoirs, farmsteads), Stone Age sites with surface scatters of lithics, and several cemeteries and burial grounds of high cultural significance. These resources are protected under the NHRA and related legislation.

The main risks include disturbance or accidental destruction of heritage sites through construction or operational activities, contamination of surrounding environments affecting site integrity, and lack of awareness among workers leading to inadvertent damage. Graves and burial grounds are particularly sensitive, as they hold high emotional, religious, and historical importance, while archaeological scatters, although often of lower significance, collectively contribute to regional heritage knowledge.

If unmitigated, the operational phase may result in irreversible loss of heritage resources and contravention of heritage legislation. However, with mitigation measures such as maintaining buffer zones, ongoing monitoring, implementation of chance finds procedures, and staff awareness training, impacts can be reduced to low significance.

15.1.12.2 Decommissioning Phase

During the decommissioning phase, heritage impacts are likely to arise from demolition, site clearing, and rehabilitation activities. Risks include accidental disturbance or destruction of heritage features such as farmstead remains, irrigation infrastructure, or surface scatters of Stone Age artefacts, as well as exposure of unmarked graves during rehabilitation and earthworks. Vibrations and dust from demolition can further degrade fragile structures, and without appropriate controls, cultural landscapes may lose integrity.

The decommissioning process also provides an opportunity to integrate heritage management into closure, for example by documenting, conserving, or relocating significant artefacts or structures, and by memorialising cemeteries and burial grounds to ensure long term protection. Key mitigation measures include implementing a detailed decommissioning Heritage Management Plan, consultation with heritage authorities, securing permits where required, and engaging affected communities—particularly where graves and burial grounds are concerned. Post closure monitoring and preservation of identified sites will be essential to safeguard the cultural landscape.

If mitigation is properly implemented, decommissioning activities can avoid permanent loss of heritage value and ensure that sites of conservation, historical, or cultural importance are preserved for future generations.

15.1.13 Socio-Economic

15.1.13.1 Operational Phase

During the operational phase, Beatrix 4 Shaft will play a central role in sustaining the local economy. The mine will generate direct employment opportunities for skilled, semi-skilled, and unskilled workers, with indirect jobs created through contractors, suppliers, and service providers. This will contribute to household income stability, poverty alleviation, and improved standards of living for many families within the Matjhabeng and Masilonyana municipalities. Local procurement initiatives will further strengthen small and medium enterprises (SMEs), while training and skills development programmes will enhance the employability of the workforce.

At the community level, the mine will contribute to infrastructure development, such as road maintenance and social investment programmes, while supporting the revenue base of local municipalities through rates, taxes, and service fees. These contributions will enable municipalities to improve service delivery and social welfare initiatives.

However, the operational phase will also bring socio-economic risks. The reliance of the local economy on the mining sector will create vulnerability to commodity fluctuations and operational disruptions. The influx of job-seekers may increase the demand for housing, education, and healthcare, placing strain on already limited municipal resources. Health risks associated with dust, noise, traffic, and hazardous substances will remain a concern for nearby communities, while social challenges such as crime, substance abuse, and inequality may intensify if not proactively managed.

To maximise socio-economic benefits and minimise risks, the mine will need to continue engaging with communities, local government, and other stakeholders, implement corporate social responsibility initiatives, and support economic diversification efforts beyond mining. If effectively managed, Beatrix 4 Shaft will provide a stable socio-economic foundation during its operational life.

15.1.13.2 Decommissioning Phase

The decommissioning of Beatrix 4 Shaft will present significant socio-economic challenges for surrounding communities. The closure of operations will lead to large-scale job losses, both directly at the mine and indirectly in sectors that depend on mining activity, such as retail, transport, and services. Household incomes will decline, contributing to rising unemployment, poverty, and social vulnerability. The economic dependency of the Matjhabeng and Masilonyana municipalities on the mine's revenue contributions will also create fiscal strain, reducing the ability of local authorities to provide adequate services such as water, sanitation, healthcare, and housing.

The loss of employment and reduced economic opportunities will likely trigger out-migration, leading to the depopulation of mining towns and a weakening of social networks and cohesion. This could exacerbate crime, informal housing growth, and social instability in affected communities. Culturally, closure will also disrupt the identity and heritage of mining-dependent settlements, as families who have relied on the mine for generations will face uncertainty regarding future livelihoods.

Despite these negative impacts, the decommissioning phase will also create opportunities. Closure planning and rehabilitation will employ workers in short-term jobs focused on demolition, environmental rehabilitation, and infrastructure repurposing. Properly managed closure will rehabilitate land for agricultural use, grazing, renewable energy projects, or other alternative post-mining developments. If supported by government and private sector collaboration, these land use transitions will reduce long term vulnerability and provide sustainable livelihoods.

To reduce negative socio-economic consequences, proactive measures will need to be implemented. These will include:

- Social transition programmes for employees and their families.
- Reskilling and retraining initiatives to enable workers to access employment in other sectors.
- Early stakeholder engagement to align closure plans with municipal development frameworks.
- Partnerships with government and business to promote economic diversification, such as renewable energy, agriculture, or manufacturing.
- Strengthening of social safety nets to cushion vulnerable groups from the immediate impacts of closure.

If closure is aligned with sustainable development goals and integrated into regional economic planning, the long term socio-economic legacy of Beatrix 4 Shaft will shift from vulnerability to resilience, providing opportunities for sustainable land use and livelihoods beyond mining.

15.2 Final Site Map

Refer to Figure 5-1.

15.3 Summary of the Positive and Negative Impacts and Risks of the Proposed Activity and Identified Alternatives

15.3.1 Positive Impacts and Benefits

The continuation of operations at Beatrix 4 Shaft will bring significant socio-economic, environmental management, and regional development benefits. On the socio-economic front, the mine will sustain direct employment for a large workforce and indirectly support contractors, suppliers, and service providers. This will contribute to poverty alleviation, household income security, and improved quality of life for many families in the Matjhabeng and Masilonyana municipalities. Local procurement will provide opportunities for SMEs, while training and skills development programmes will enhance long term employability and capacity building within the region.

At the community and municipal level, Beatrix will continue to contribute rates, taxes, and service fees, supporting local government's ability to deliver essential services. Through its SLP commitments, the mine will also invest in infrastructure, social welfare, and Local Economic Development (LED) projects, further strengthening community resilience and improving social cohesion.

From an environmental perspective, the project will support opportunities for progressive rehabilitation and closure planning. Activities such as shaping, capping, and revegetating disturbed areas will help stabilise land, reduce dust and erosion, and improve land capability for grazing or alternative post-mining uses. Rehabilitation will also contribute to the protection of wetlands, biodiversity corridors, and cultural landscapes, aligning with the closure objective of creating a safe, stable, and non-polluting environment. The phased reduction of disturbance during closure provides opportunities for land repurposing, including agricultural use, renewable energy projects, or conservation initiatives, thereby diversifying the post-mining economy.

Overall, the project has the potential to deliver meaningful socio-economic upliftment while contributing to environmental stewardship and improved post-mining land use.

15.3.2 Negative Impacts and Risks

Balanced against these benefits, the proposed activities will also generate E&S risks that must be carefully managed. From an environmental standpoint, the establishment and operation of infrastructure such as TSFs, WRDs, and evaporation dams will permanently alter the topography, sterilise soils, and reduce land capability within the footprint. Residual seepage from these facilities poses a long term risk to groundwater and surface water quality, with elevated sulphate, chloride, and uranium concentrations threatening sensitive receptors such as the Boschluis Spruit wetlands. Chemical and hydrocarbon spills from workshops, fuel bays, and process plants may further degrade soils and water resources if not properly contained.

Biodiversity is also at risk. The project area contains the Endangered Gh10 Vaal-Vet Sandy Grassland and supports CI species such as *Boophone disticha* (Bushman's Poison Bulb), *Hypoxis hemerocallidea* (African Potato), and the Vulnerable Black-footed Cat (*Felis nigripes*). Continued habitat loss, overgrazing, invasive alien species encroachment, and dust and noise disturbance from mining operations will contribute to ecological decline if not mitigated. Wetlands, which play an important role in nutrient assimilation and flood regulation, may be further degraded by altered hydrology, salinisation, and sediment inputs.

Air quality impacts remain a concern due to particulate matter (PM_{10} and $PM_{2.5}$) and fugitive dust emissions from TSFs and waste facilities. These pollutants pose health risks to both workers and surrounding communities, as well as ecological impacts to grasslands and wetlands. Noise, although compliant with SANS 10103 thresholds, has the potential to disturb nearby communities and sensitive fauna such as the African Grass-owl (*Tyto capensis*).

From a socio-economic perspective, mining dependency increases vulnerability to commodity fluctuations and potential retrenchments. Decommissioning poses the most significant socio-economic challenge, as large-scale job losses, reduced procurement, and a diminished municipal revenue base may lead to poverty, unemployment, and out-migration. These risks will be compounded by the permanent loss of agricultural land within the mine footprint and the cultural impacts associated with the disturbance of heritage resources such as farmsteads, Stone Age sites, and cemeteries.

In summary, while the project will deliver notable socio-economic benefits and opportunities for environmental rehabilitation, it also carries high to medium significance risks, particularly relating to water resources, biodiversity, heritage, and post-mining socio-economic stability. Effective mitigation, long term monitoring, and adaptive management will be critical to ensuring that residual impacts remain within acceptable limits.

16 PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The EMPr outlines the framework through which environmental risks associated with the Beatrix MR will be mitigated, monitored, and managed in compliance with relevant legislation, despite the administrative nature of the proposed amendment. While no new development or physical activity is proposed, the EMPr remains critical to maintaining the environmental integrity of the site and ensuring that the consolidation of rights does not compromise ongoing environmental stewardship.

16.1 Key Objectives of the Environmental Management Programme

The EMPr is guided by the following environmental management objectives:

- To prevent and minimise environmental degradation throughout the LoM.
- To ensure that existing environmental sensitivities and risks—particularly those flagged in specialist assessments—are appropriately managed.
- To facilitate the implementation of best practice mitigation measures based on historical and existing environmental baselines.
- To promote ongoing rehabilitation and restoration of disturbed areas.
- To preserve ecosystem services, biodiversity, and cultural heritage assets.
- To ensure that monitoring, reporting, and corrective action systems are in place for adaptive environmental management.

16.2 Impact Management Outcomes

The following impact management outcomes have been developed for inclusion in the EMPr and potential authorisation conditions:

16.2.1 Soils and Land Capability

Disturbed soils will be stripped, stockpiled, and managed in a manner that prevents erosion, salinisation, and contamination. Rehabilitated areas will be stabilised with appropriate topsoil and vegetation cover, ensuring that post-mining land capability supports grazing or agricultural use where feasible. Long term soil quality will remain suitable for sustainable land uses.

16.2.2 Surface Water

Surface water resources, including the Boschluis Spruit and associated wetlands, will be protected from contamination by maintaining clean and dirty water separation, implementing stormwater controls, and ensuring all effluent and discharges comply with the standards of the DWS. Monitoring will confirm that surface water quality trends remain stable or show progressive improvement.

16.2.3 Groundwater

Groundwater quality and levels will be safeguarded through seepage control, monitoring, and treatment where required. No uncontrolled decant or contamination plume migration will occur beyond the MR boundary. Post closure, groundwater will remain stable and non-polluting, supporting downstream users and ecosystems.

16.2.4 Wetlands and Biodiversity

Wetland and grassland habitats will retain their ecological functionality, with no net loss of CI species. Rehabilitation and alien invasive plant management will restore ecological corridors and riparian systems, ensuring the long term persistence of biodiversity.

16.2.5 Air Quality

Dust fallout, particulate emissions, and gaseous pollutants will be managed to remain within national standards, safeguarding the health of workers, nearby communities, and sensitive ecological receptors. Rehabilitation will progressively reduce dust generation from disturbed areas.

16.2.6 Noise

Noise levels from operational activities will remain below the thresholds set by SANS 10103 for the surrounding rural and residential receptors. During decommissioning, noise will be temporary and managed through best practice control measures to minimise disturbance.

16.2.7 Heritage Resources

No unlawful disturbance or destruction of heritage sites, archaeological material, or burial grounds will occur. Heritage resources will be protected, conserved, or, where unavoidable, managed in consultation with the South African Heritage Resources Agency (SAHRA) and affected communities under approved permits.

16.2.8 Socio-Economic

The mine will provide sustained employment and procurement opportunities, contributing to LED while mitigating risks of dependency and inequality. Closure planning will include social transition measures, skills development, and stakeholder engagement to reduce socio-economic vulnerability and create pathways for alternative livelihoods.

16.2.9 Rehabilitation and Closure

All disturbed areas will be rehabilitated to a safe, stable, non-polluting, and visually integrated post-mining landscape. Monitoring and maintenance programmes will be implemented for at least five years post closure, ensuring that rehabilitation outcomes are achieved and sustained.

17 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

Should the CA grant EA, the following conditions must be included to ensure compliance and minimise residual impacts:

- Water Resources
  - Continuous groundwater and surface water monitoring must be undertaken at all compliance points, with results submitted quarterly to the DWS.
  - Seepage interception systems and clean/dirty water separation infrastructure (in accordance with GN 704 of 1999) must be maintained throughout the LoM and post closure.
  - A TARP must be implemented for groundwater and surface water, with threshold values for sulphate, chloride, uranium, and EC.
- Waste and Pollution Control
  - All hazardous substances, hydrocarbons, and chemicals must be stored in lined, bunded areas sized to 110% of the largest container capacity.
  - A site-wide Waste Management Plan must be implemented, covering segregation, recycling, licensed disposal, and auditing, in line with the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA).

  - Post closure, all contaminated soils must be excavated, treated (e.g., bioremediation), or disposed of at licensed facilities.
- Biodiversity and Wetlands
  - Wetland buffers must be enforced around the Boschluis Spruit valley-bottom system and seep wetlands, with active monitoring of PES and EIS ratings.
  - An alien invasive plant management programme (targeting *Tamarix* spp. and *Opuntia* spp.) must be implemented during operations and closure.
  - Rehabilitation of grassland and wetland habitats must prioritise re-establishing indigenous species, including propagation and reintroduction of CI species.
- Air Quality and Noise
  - A comprehensive ambient air quality monitoring programme must be maintained for PM_{10}, $PM_{2.5}$, alpha quartz, heavy metals, and VOCs.
  - Dust suppression measures must be applied on TSFs, WRDs, haul roads, and demolition sites, with progressive rehabilitation of disturbed land.
  - Noise monitoring in line with SANS 10103:2008 and SANS 10328:2008 must continue, with mitigation measures (barriers, silencers, and restricted operating hours) implemented where exceedances or nuisance levels are detected.
- Heritage Resources
  - A Heritage Management Plan must be implemented in line with the NHRA.
  - All graves, burial grounds, and identified heritage features must be demarcated and conserved, with relocation or disturbance only permitted following SAHRA approval and stakeholder consultation.
  - Chance find procedures must be in place for archaeological or palaeontological discoveries during any ground disturbance.
- Socio-Economic Commitments
  - The SLP must be implemented in full, with particular focus on local employment, procurement, training, and economic diversification initiatives.
  - A closure social transition plan must be developed at least five years prior to decommissioning, addressing retrenchment, reskilling, and municipal revenue support.
  - Stakeholder engagement must continue through the LoM, with transparent reporting of E&S performance.
- Closure and Rehabilitation

- A detailed Closure Plan must be maintained and updated every five years, including financial provision for long term water treatment, land rehabilitation, and monitoring.
- TSFs and WRDs must be capped with a minimum of 500 mm of soil cover and vegetated with indigenous species to achieve long term stability.
- Post closure monitoring for groundwater, surface water, biodiversity, and air quality must continue for a minimum of five years, or longer if significant residual impacts persist.

- Monitoring Programmes
  - All monitoring must continue and extend for a period (to be determined) post closure, or longer if residual impacts persist.
  - Rehabilitation success must be monitored through vegetation establishment, erosion control, and land capability assessments.
  - Socio-economic monitoring must be undertaken to track the effectiveness of employment and skills transfer commitments.
- Reporting Obligations
  - Annual performance assessment and environmental audit reports must be submitted to the DMPR, confirming compliance with the EMPr and conditions of authorisation.

18 DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

In compiling this report, GCS has relied exclusively on information provided by the client. No independent site inspections were undertaken as part of this assessment. The following assumptions, uncertainties, and knowledge gaps are noted:

- Reliance on client data: Information on mining methods and operational schedules was supplied by the client and is assumed to be accurate and up to date.
- Baseline information: Baseline environmental conditions are based on existing reports and available data. It is assumed that this information remains valid and representative of current site conditions.
- Specialist modelling results: Specialist studies and modelling outputs have been relied upon without independent verification. It is assumed that these remain valid and representative of current site conditions.
- Impact assessments: E&S impacts have been assessed using previously approved studies, with the assumption that no significant changes to operational design or environmental context have occurred since those assessments.

- Socio-economic conditions: Assumptions have been made that current employment levels, regional economic reliance on mining, and community dynamics will remain broadly consistent over the operational life of the mine.
- Cumulative impacts: The assessment assumes that cumulative impacts from neighbouring or regional operations have been appropriately captured in existing studies.
- Monitoring data: Where monitoring data has been used, it is assumed that this data is accurate and collected according to appropriate standards.

Overall, while assumptions and uncertainties exist due to the reliance on secondary information, they are consistent with the level of detail and do not affect the overall confidence in the findings and recommendations presented.

19 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

19.1 Reasons why the activity should be Authorised or Not

It is the reasoned opinion of the EAP that the proposed activity should be authorised. The key reasons are as follows:

- The application does not involve any new surface land disturbance or additional infrastructure development.
- No further or significant environmental impacts are anticipated, as all potential impacts have already been assessed and are effectively managed under the approved EMPr.
- The activity secures the continuation of mining operations that contribute substantially to local socio-economic conditions. Extending the LoM to 2041 provides certainty of employment, supports associated industries, and ensures that host municipalities and communities continue to benefit from mine-linked development contributions, taxes, royalties, and SLP commitments. This directly addresses regional socio-economic challenges such as unemployment, limited alternative livelihoods, and the need for economic diversification.
- The recommissioning further promotes alignment with national policy frameworks, including the NDP 2030, which prioritises inclusive growth, sustainable mineral resource development, and job creation.

Based on the above, the continuation of mining operations is considered both environmentally manageable and socio-economically desirable.

19.2 Conditions that must be Included in the Authorisation

Should the CA grant EA, the following conditions must be included to ensure compliance and minimise residual impacts:

- Water Resources
  - Continuous groundwater and surface water monitoring must be undertaken at all compliance points, with results submitted quarterly to the DWS.
  - Seepage interception systems and clean/dirty water separation infrastructure (in accordance with GN 704 of 1999) must be maintained throughout the LoM and post closure.
  - A TARP must be implemented for groundwater and surface water, with threshold values for sulphate, chloride, uranium, and EC.
- Waste and Pollution Control
  - All hazardous substances, hydrocarbons, and chemicals must be stored in lined, bunded areas sized to 110% of the largest container capacity.
  - A site-wide Waste Management Plan must be implemented, covering segregation, recycling, licensed disposal, and auditing, in line with the NEMWA.
  - Post closure, all contaminated soils must be excavated, treated (e.g., bioremediation), or disposed of at licensed facilities.
- Biodiversity and Wetlands
  - Wetland buffers must be enforced around the Boschluis Spruit valley-bottom system and seep wetlands, with active monitoring of PES and EIS ratings.
  - An alien invasive plant management programme (targeting *Tamarix* spp. and *Opuntia* spp.) must be implemented during operations and closure.
  - Rehabilitation of grassland and wetland habitats must prioritise re-establishing indigenous species, including propagation and reintroduction of CI species.
- Air Quality and Noise
  - A comprehensive ambient air quality monitoring programme must be maintained for PM_{10}, $PM_{2.5}$, alpha quartz, heavy metals, and VOCs.
  - Dust suppression measures must be applied on TSFs, WRDs, haul roads, and demolition sites, with progressive rehabilitation of disturbed land.
  - Noise monitoring in line with SANS 10103:2008 and SANS 10328:2008 must continue, with mitigation measures (barriers, silencers, and restricted operating hours) implemented where exceedances or nuisance levels are detected.
- Heritage Resources
  - A Heritage Management Plan must be implemented in line with the NHRA.
  - All graves, burial grounds, and identified heritage features must be demarcated and

conserved, with relocation or disturbance only permitted following SAHRA approval and stakeholder consultation.

- Chance find procedures must be in place for archaeological or palaeontological discoveries during any ground disturbance.

- Socio-Economic Commitments
  - The SLP must be implemented in full, with particular focus on local employment, procurement, training, and economic diversification initiatives.
  - A closure social transition plan must be developed at least five years prior to decommissioning, addressing retrenchment, reskilling, and municipal revenue support.
  - Stakeholder engagement must continue through the LoM, with transparent reporting of E&S performance.
- Closure and Rehabilitation
  - A detailed Closure Plan must be maintained and updated every five years, including financial provision for long term water treatment, land rehabilitation, and monitoring.
  - TSFs and WRDs must be capped with a minimum of 500 mm of soil cover and vegetated with indigenous species to achieve long term stability.
  - Post closure monitoring for groundwater, surface water, biodiversity, and air quality must continue for a minimum of five years, or longer if significant residual impacts persist.
- Monitoring Programmes
  - All monitoring must continue and extend for a period (to be determined) post closure, or longer if residual impacts persist.
  - Rehabilitation success must be monitored through vegetation establishment, erosion control, and land capability assessments.
  - Socio-economic monitoring must be undertaken to track the effectiveness of employment and skills transfer commitments.
- Reporting Obligations
  - Annual performance assessment and environmental audit reports must be submitted to the DMPR, confirming compliance with the EMPr and conditions of authorisation.

20 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

According to the 2025 Mine Works Programme for Beatrix 4 Shaft, the projected LoM extends until

2041. The EA is therefore required for the full operational life of the mine, with an additional period of at least 5 years post-LoM to allow for decommissioning, rehabilitation, and post closure monitoring. This ensures that all environmental obligations are fulfilled until final closure certificates are issued by the relevant authorities.

21 UNDERTAKING

Sibanye Gold, confirm that:

- The information provided in this Basic Assessment Report (BAR) and EMPr is to the best of their knowledge true and correct.
- All mitigation measures, monitoring requirements, and rehabilitation commitments contained in the EMPr will be implemented and maintained for the duration of the project.
- They will ensure that adequate financial, human, and technical resources are available to meet these obligations.
- This Undertaking applies equally to both the BAR and the EMPr and remains valid until a Closure Certificate is issued in terms of Section 43 of the MPRDA.

21.1 Undertaking Under Oath/ Affirmation

I, Kahmani Gounden wear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature: [signature]

Sibanye Gold Proprietary Limited

Date: 15/01/2026

[signature]

Signature of the Commissioner of Oaths:

Date: 15|01|2026

[signature]

COMMISSIONER OF OATHS (RSA)
Wendy Sherriff CA(SA)
63 Wessel Road, Woodmead
Johannesburg

I certify that the DEPONENT has acknowledged that he/she knows and understands the contents of this affidavit, that he/she does not have any objection to taking the oath, and that he/she considers it to be binding on his/her conscience, and which was sworn to and signed before me

at ....Rivonia.... on this the ..15.. day of ....1.... 20.26.. and that the administering oath complied with the regulations contained in Goverment Gazette No. R1258 of 21 July 1972, as amended.

22 FINANCIAL PROVISION

22.1 Explain how the Aforesaid Amount was Derived

The financial provision requirement for Beatrix 4 Shaft has been derived through a comprehensive closure costing exercise initially prepared by Golder Associates in 2020 and subsequently updated by WSP in 2024 to reflect current conditions, unit rates, and assumptions. The closure costing methodology follows the requirements of the Financial Provisioning Regulations (GN R1147) and aligns with the closure objectives established for the operation.

The calculation incorporated all closure and rehabilitation measures identified in the Closure Plan (Golder Associates Africa, 2021), including the dismantling and demolition of infrastructure, rehabilitation of WRDs and TSFs, remediation of contaminated areas, and general surface rehabilitation. Additional allowances were made for contingencies, engineering designs, specialist studies, and long term monitoring of groundwater, surface water, and rehabilitated areas. Provision was also included for the continued pumping of water at the Titanic pump station for a period of up to 10 years.

The updated costing prepared in March 2024 determined that the total financial provision required for an unscheduled closure of Beatrix 4 Shaft amounts to R482 156 121 (exclusive of VAT). This figure was derived from a detailed breakdown of infrastructural aspects, mining aspects, surface rehabilitation, surface water reinstatement, preliminary and general costs, contingencies, additional studies, and long term monitoring and aftercare requirements. The amount therefore represents a full and realistic estimate of the costs required to implement rehabilitation and closure measures in accordance with the regulatory framework.

22.2 Confirm that this Amount can be Provided for from Operating Expenditure

The financial provision of R482 156 121 (exclusive of VAT) will be met through the financial provision is already held by the DMPR on behalf of the mine, and this amount will be reviewed and adjusted as necessary to ensure it remains sufficient to cover the updated closure liability.

23 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

The sections below provide additional information in support of the application and should be considered by the CA.

23.1 Impact on the Socio-Economic Conditions of any Directly Affected Person

The proposed recommissioning of Beatrix 4 Shaft through the transaction between Sibanye Gold and Neo Energy presents significant socio-economic benefits for directly affected persons. Previously placed under care and maintenance due to declining gold reserves and weak uranium prices, the shaft's reopening under Neo Energy's management is expected to revitalise economic activity in the Masilonyana and Matjhabeng Local Municipalities.

From an economic perspective, the recommissioning will reintroduce mineral production, particularly uranium and gold, both of which are in rising global demand. This renewed production will stimulate direct employment opportunities within the mining operations and create additional indirect jobs through associated industries such as transport, equipment supply, engineering services, and local retail. These benefits will contribute to regional development goals, align with the NDP2030, and support GDP growth in a historically mining-dependent area.

From a social perspective, the recommencement of mining will address some of the acute challenges of high unemployment and limited alternative livelihoods. The project has the potential to enhance local socio-economic wellbeing by creating jobs, supporting skills development, and offering opportunities for youth employment. Building on the framework of Sibanye Gold's approved SLP, Neo Energy may leverage existing commitments to strengthen community development initiatives, transfer skills, and create sustainable socio-economic benefits for directly affected communities.

From a regulatory and environmental perspective, the amendment of MR application provides legal and administrative certainty, ensuring compliance with the MPRDA. This process aligns with national objectives of sustainable resource development, transparency, and accountability. It also confirms that Neo Energy, as the new operator, will inherit and be bound by existing environmental, social, and labour obligations, thereby ensuring continuity of responsible mining practices.

23.2 Impact on any National Estate Referred to in Section 3(2) of the National Heritage Resources Act

As no new ground disturbance, infrastructure development, or expansion of the authorised mining footprint will take place, there will be no impact on any heritage resources as defined under Section 3(2) of the National Heritage Resources Act, 1999 (Act 25 of 1999).

24 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT

No additional matters are required in terms of Section 24(4)(A) and (B) of the Act.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

25 DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

25.1 Details of the Environmental Assessment Practitioner

The details of the EAP have been provided in Part A, Section 2.2 of this report.

25.2 Description of the Aspects of the Activity

The activities are described in Section 5 of Part A of this report.

25.3 Composite Map

This composite map (Figure 25-1) illustrates Beatrix 4 Shaft (Beisa Operation) (outlined in magenta) in relation to key environmental sensitivities and landscape features. The map integrates the National Wetland Map 5 dataset, showing the presence and distribution of channelled valley-bottom wetlands, seep wetlands, depression wetlands, and riverine systems in and around the project area. Perennial watercourses, including the nearby river system flowing east–west north of the site, are indicated. The map also overlays the latest Terrestrial Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), highlighting zones with elevated conservation value that contribute to biodiversity pattern and ecological processes. The project footprint intersects primarily with ESA1 and ESA2 areas, with limited overlap with CBA patches occurring towards the northern extent. Local farm portions, road infrastructure, and nearby regional towns (such as Virginia and Merriespruit) are shown to provide geographic context. This spatial sensitivity assessment is used to inform the environmental impact evaluation, avoidance considerations, and the development of appropriate mitigation and management measures.

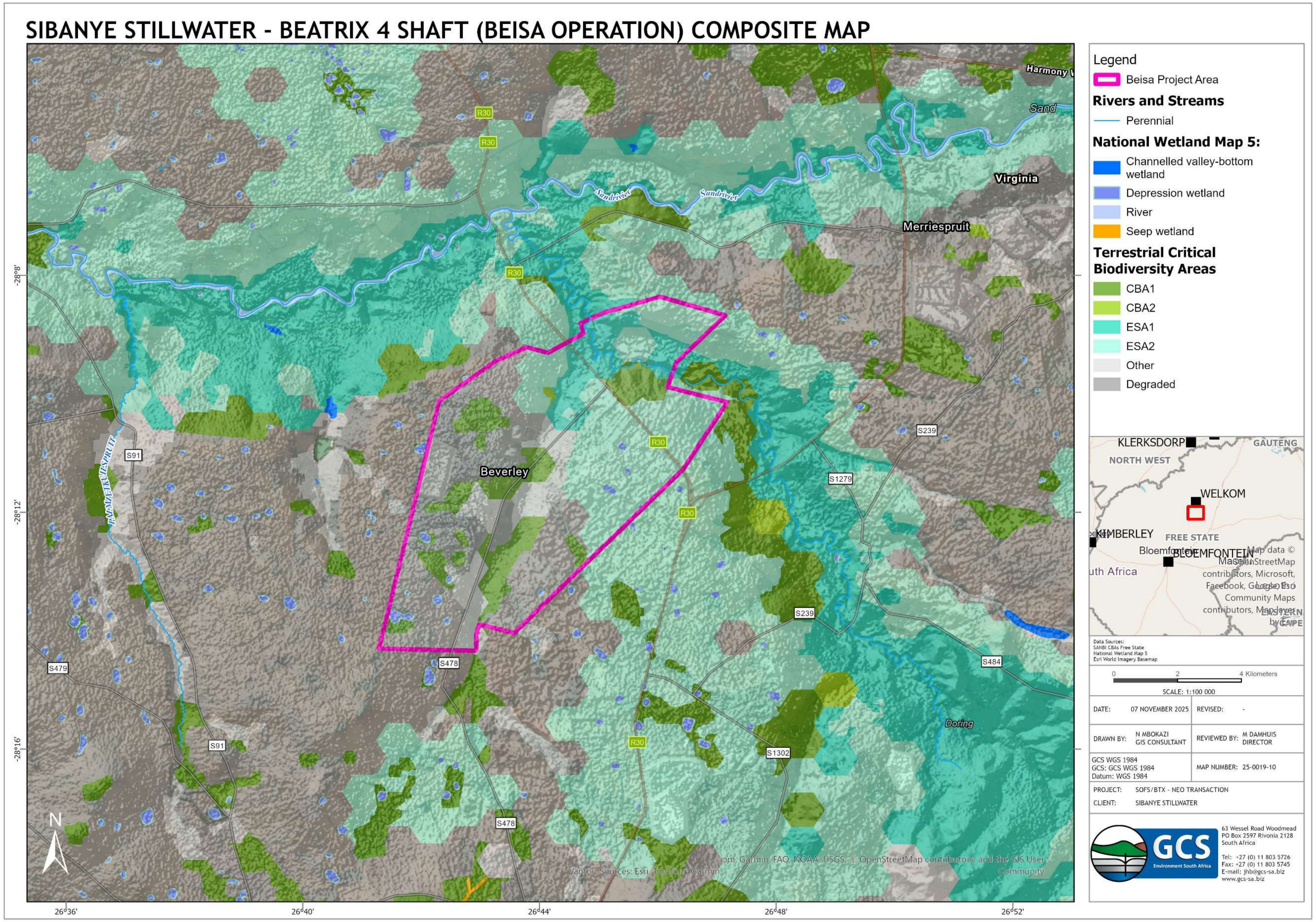


Figure 25-1: Composite Map

25.4 Description of Impact management objectives including management statements

The purpose of the impact management objectives is to provide a structured framework for preventing, minimising, and remedying E&S impacts arising from mining activities. These objectives are linked to specific management statements that reflect Sibanye Gold's commitments to compliance with legislation, conditions of authorisation, and recognised best practice standards.

Overall Objective:

To conduct mining activities at Beatrix 4 Shaft in a manner that avoids unacceptable environmental degradation, safeguards human health and safety, ensures sustainable post-mining land use, and maximises socio-economic benefits for surrounding communities and directly affected stakeholders.

25.4.1 Soil and Land Capability

Objective: To protect soil resources against contamination, erosion, and salinisation, ensuring that soils retain their capacity to support post-mining land uses such as grazing and limited agriculture.

Management Statements:

- Strip, stockpile, and preserve topsoil prior to disturbance, ensuring stockpiles are vegetated and stabilised.
- Implement strict erosion control measures and progressive rehabilitation of disturbed land.
- Monitor soil quality for salinity, hydrocarbons, and heavy metals; remediate contaminated soils using excavation, bioremediation, or chemical amelioration.
- Restore land capability by re-contouring disturbed areas, reapplying stored topsoil, and establishing indigenous vegetation.

25.4.2 Groundwater

Objective: To prevent deterioration of groundwater quality and ensure sustainable water use for communities, ecosystems, and future land uses.

Management Statements:

- Maintain and expand the borehole monitoring network to detect plume migration and changes in water quality.
- Apply seepage interception drains, containment systems, and treatment solutions where contamination is detected.
- Develop and implement a TARP for exceedances of water quality thresholds.
- Incorporate long term post closure groundwater monitoring and treatment provisions into closure planning.

25.4.3 Surface Water

Objective: To protect downstream watercourses and wetlands from contamination and altered hydrology.

Management Statements:

- Separate clean and dirty water systems in compliance with GN 704 of 1999.
- Maintain stormwater management infrastructure, including diversions, berms, and drains.
- Prevent uncontrolled discharges to surface water; all discharges must comply with the National Water Act.
- Regularly monitor upstream and downstream compliance points to track potential contamination.

25.4.4 Biodiversity (Flora, Fauna, Wetlands)

Objective: To conserve biodiversity, maintain ecosystem services, and protect CI species and habitats.

Management Statements:

- Map and protect sensitive habitats including wetlands, riparian zones, and climax grasslands.
- Implement alien invasive plant control (e.g., *Tamarix ramosissima, Opuntia ficus-indica*).
- Relocate or propagate CI plant species where disturbance is unavoidable.
- Maintain ecological corridors to support faunal movement and habitat connectivity.
- Undertake ongoing biodiversity monitoring and adaptive management in collaboration with stakeholders.

25.4.5 Air Quality and Noise

Objective: To prevent significant deterioration of ambient air quality and minimise noise disturbance to communities and fauna.

Management Statements:

- Apply dust suppression (water sprays, capping of TSFs/WRDs, vegetative cover).
- Monitor particulate matter (PM_{10}, $PM_{2.5}$), alpha quartz, and gaseous pollutants; maintain compliance with the NEMAQA.
- Use enclosures, silencers, and dampening measures to reduce noise at key sources.
- Conduct regular noise monitoring as per SANS 10103 and SANS 10328.

25.4.6 Heritage

Objective: To ensure protection and conservation of archaeological, cultural, and historical resources.

Management Statements:

- Implement and enforce a Heritage Management Plan aligned with the National Heritage Resources Act (Act 25 of 1999).
- Apply chance find procedures for newly uncovered heritage resources.
- Protect cemeteries and burial grounds with buffer zones and community engagement.
- Obtain necessary permits for any alteration or relocation of heritage resources.

25.4.7 Socio-Economic

Objective: To maximise socio-economic benefits during operations and reduce social risks associated with closure.

Management Statements:

- Prioritise local employment, procurement, and training initiatives to build economic resilience.
- Implement SLP commitments to support education, healthcare, and infrastructure.
- Prepare a social transition programme for decommissioning, including reskilling, retraining, and stakeholder engagement.
- Partner with municipalities and other stakeholders to align closure planning with LED frameworks.

25.4.8 Volumes and Rate of Water Use Required for the Operation

According to the IWWMP 2022 Update for Beatrix Mine (Shangoni, 2022), Beatrix 4 Shaft and its supporting infrastructure are authorised for several water uses in terms of Section 21 of the NWA. These can be grouped as follows:

- Abstraction and Dewatering
    - Groundwater abstraction at Beatrix 4 Shaft for mining processes: approximately 4.745 million m^3 per annum is pumped from underground workings to allow safe access and to supply water for operations
    - Additional dewatering also occurs at Shafts 1, 2 and 3, but for Beatrix 4 Shaft specifically, this water use ensures control of underground fissure water and prevents shaft flooding
- Disposal and Storage
    - Disposal of excess process water into the Beatrix 4 Shaft Evaporation Dams: up to 2.92 million m^3 per annum of affected water is disposed here. The dams are located on portions of the farm Palmietkuil 328 and Kalkoenkrans 225.
    - Emergency storage in the Beatrix 4 Shaft Emergency Dam: about 40 000 m^3 per annum of mine water may be temporarily stored to prevent uncontrolled release

into the environment.

- Wastewater Treatment and Irrigation
  - Use of treated wastewater for irrigation: Purified effluent from the Beatrix 4 Shaft Wastewater Treatment Works (WWTW) is applied to irrigate gardens and sports grounds, covering roughly 10 ha, with an allocation of 63 510 m^3 per annum
  - Discharge of treated effluent: Treated water from the Beatrix 4 Shaft WWTW is released into the Boschluis Spruit, amounting to approximately 949 000 m^3 per annum

25.4.9 Has a Water Use Licence been Applied for?

The mine operates under an existing WUL 08/C42K/AEFJG/8739, dated 31 October 2018 and the subsequent amendment of 21 April 2021. For a copy of the WUL refer to Appendix F.

25.5 Impacts to be mitigated in their respective phases

The table below outlines the impacts to be mitigated in their respective phases, together with the measures required to rehabilitate the environment affected by the undertaking of listed and associated activities. It specifies the size and scale of disturbance, mitigation measures, relevant South African standards, and the timeframe for implementation.

Table 25-1: Impacts, Mitigation Measures, Standards and Implementation Timeframes

Activities	Phase	Size and Scale of Disturbance	Mitigation / Management Measures	Compliance with South African Standards and Legislation	Time Period for Implementation
Construction and operation of waste rock dumps, tailings storage facilities (TSFs) and evaporation dams	Operational	Large, permanent modification of landscape, covering several hectares with engineered landforms	• All construction areas must be clearly demarcated to prevent unnecessary disturbance. • Topsoil must be stripped, stockpiled, and managed to maintain fertility. • A Stormwater Management Plan must be designed, implemented, and regularly reviewed to prevent erosion and uncontrolled runoff. • Slopes must be engineered to stable gradients and protected against erosion with gabions or vegetation. • Progressive rehabilitation must be undertaken throughout operations to stabilise landforms and reduce long term visual intrusion.	• National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA). • National Water Act, 1998 (Act 36 of 1998) (NWA). • Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA).	Throughout operational life of mine and closure
Handling and storage of hydrocarbons and chemicals	Operational	Localised soil, groundwater, and surface water contamination at workshops, fuel bays, and chemical stores	• All hydrocarbon and chemical storage facilities must be bunded, lined, and fitted with oil and silt traps to prevent leakage. • Regular inspections and maintenance of tanks and pipelines must be conducted. Spill kits must be available on-site, and emergency spill drills must be held quarterly. • Hazardous waste must be disposed of at licensed facilities with disposal certificates. • Material Safety Data Sheets must be kept accessible at all storage areas, and all staff must be trained in spill response procedures.	• NEMA. • National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA). • SANS 10228/10229. • Occupational Health and Safety Act, 1993 (Act 85 of 1993) (OHSA).	Continuous during operations
Demolition of infrastructure and waste facilities	Decommissioning	Short-term but high-risk disturbance during dismantling, demolition, and rehabilitation	• All contaminated soils and concrete slabs must be excavated and removed to a depth of at least 1 m and transported to licensed hazardous waste disposal facilities. • Salvageable equipment must be decontaminated prior to reuse. • Hydrocarbon-contaminated soils must be bioremediated. • Stormwater diversion and erosion control measures must remain in place during demolition. • Post closure monitoring of rehabilitated footprints must be undertaken for a minimum of 5 years.	• NEMA. • NWA. • NEMWA. • OHSA.	Closure and post closure
Mining infrastructure (TSFs, WRDs, evaporation dams)	Operational	Loss of arable land and permanent sterilisation of agricultural potential within facility footprints	• Progressive rehabilitation must be integrated into mine planning. • Vegetation cover must be established on inactive areas to reduce erosion. • Dust suppression (e.g., water sprays, hydroseeding) must be applied on exposed surfaces. • Topsoil and subsoil must be stripped and stored separately to preserve fertility for reapplication during closure.	• NEMA. • CARA.	Life of mine
Rehabilitation of TSFs/WRDs	Decommissioning	Large, permanent engineered landforms remain in the post-mining landscape	• Final landforms must be re-contoured to stable slopes (≤1:4 for TSFs, ≤1:3 for WRDs). • A capping layer of at least 500 mm of topsoil must be applied, followed by vegetation establishment using indigenous grassland species. • Drainage berms and channels must be constructed to prevent erosion and manage stormwater. Long term monitoring of slope stability, vegetation success, and seepage quality must be undertaken for at least 10 years post closure.	• NEMA. • CARA. • National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA).	Closure and long term post closure
Operation of gold processing plant	Operational	Degradation of air quality from emissions of dust, SO_2, NO_x, VOCs, and trace metals	• Air filtration systems must be installed and maintained. • Dust suppression (including misting, water sprays, and windbreaks) must be implemented at stockpiles and conveyors. • Stack emissions must be monitored quarterly and reported to authorities. • Workers must be provided with PPE for dust exposure. Spillages of process chemicals must be contained and cleaned immediately.	• NEMA. • National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) (NEMAQA). • National Dust Control Regulations, 2013.	Continuous during operations
Demolition of plant and workshops	Decommissioning	High dust emissions and potential release of hazardous wastes during demolition	• Dust suppression (water sprays, chemical binders) must be implemented during demolition. • All asbestos-containing materials and hazardous wastes must be removed by licensed contractors. • Demolished materials must be sorted for recycling where possible, with hazardous waste disposed at licensed sites. • Footprints must be excavated, re-profiled, and rehabilitated.	• NEMAQA. • NEMWA. • OHSA.	Closure

Activities	Phase	Size and Scale of Disturbance	Mitigation / Management Measures	Compliance with South African Standards and Legislation	Time Period for Implementation
Ventilation fans, conveyors, and heavy machinery	Operational	Continuous operational noise affecting workers, fauna, and nearby communities	• Annual noise monitoring must be undertaken at sensitive receptors. • Barriers and acoustic enclosures must be installed around major noise sources. • Old or noisy machinery must be replaced with modern, quieter alternatives. • Work practices must minimise unnecessary idling and reverse alarms.	• NEMA. • SANS 10103:2008. • SANS 10328:2008.	Continuous
Demolition of infrastructure	Decommissioning	Short-term elevated noise impacts during dismantling and earthworks	• Noisy activities must be restricted to daytime hours. • Equipment must be fitted with silencers and mufflers. • Workers must be provided with PPE. • Noise monitoring must be conducted during demolition to ensure compliance with SANS guidelines.	• SANS 10103:2008. • OHSA.	Closure
Operation of shafts, roads, and blasting	Operational	Habitat loss, fragmentation, and disturbance to flora and fauna, including Conservation Important (CI) species	• Biodiversity Management and Action Plan must be implemented. Buffer zones must be established around wetlands and riparian corridors. • Alien invasive plants must be cleared annually. • Conservation Important (CI) species such as *Boophone disticha* (Bushman's Poison Bulb) and *Tyto capensis* (African Grass-owl) must be protected through habitat conservation and monitoring.	• NEMBA. • NEMA.	Life of mine
Rehabilitation of habitats	Decommissioning	Risk of poor revegetation success and alien invasive encroachment	• Disturbed areas must be ripped, topsoiled, and seeded with indigenous grassland species. • Alien clearing must continue post closure. Reintroduction programmes for CI plant species must be developed in consultation with conservation authorities.	• NEMBA. • CARA.	Closure and post closure
Wetland systems (Boschluis Spruit valley-bottom and pans)	Operational	Altered hydrology, salinity increases, and degradation of ecological services	• Stormwater and seepage control systems must be maintained. Alien vegetation (e.g., *Tamarix ramosissima* and *Opuntia ficus-indica*) must be actively cleared. Wetland buffers must be enforced to prevent encroachment. • Annual biomonitoring must be undertaken to assess water quality and wetland health.	• NWA. • NEMBA. • NEMA.	Life of mine
Closure of evaporation dams, TSFs	Decommissioning	Residual seepage and wetland habitat loss post closure	• Facilities must be capped, reshaped, and vegetated. • Long term groundwater and wetland monitoring must be implemented to track seepage and contaminant migration. • Corrective measures must be triggered if water quality deteriorates.	• NWA. • NEMBA.	Closure and post closure
Heritage resources (graves, archaeological scatters, historic structures)	Operational	Risk of disturbance or destruction of heritage assets	• Heritage Chance Finds Procedure must be in place. • All staff must undergo heritage awareness training. • Any discovery of graves or artefacts must be reported to the South African Heritage Resources Agency (SAHRA) and work halted until clearance is granted.	• National Heritage Resources Act, 1999 (Act 25 of 1999) (NHRA).	Continuous
Rehabilitation and demolition	Decommissioning	Risk of disturbance to graves and historic structures during closure	• A Heritage Management Plan must be implemented during closure. Consultation with affected communities and heritage authorities must be undertaken. • Sites of high significance must be memorialised or conserved.	• NHRA.	Closure
Employment and procurement	Operational	Socio-economic upliftment but dependence on mining	• Local employment must be prioritised. • Training and skills development must be provided. Procurement from local SMEs must be actively promoted. • Social and Labour Plan (SLP) commitments must be implemented.	• Mining Charter. • SLP. • NEMA.	Life of mine
Mine closure	Decommissioning	Job losses and economic decline in local communities	• Social transition programmes, retraining initiatives, and economic diversification projects must be implemented. • Stakeholder engagement must be conducted with local government to align closure with regional development strategies.	• SLP. • NEMA.	Closure and post closure

25.6 Impact Management Outcomes

The table below describes the impact management outcomes to be achieved through implementation of mitigation measures. It identifies the activity, potential impact, affected aspects, project phase, mitigation type, and the standard of management required.

Table 25-2: Impact Management Outcomes

Activity (Listed / Not Listed)	Potential Impact	Aspects Affected	Phase	Mitigation Type	Standard / Outcome to be Achieved (Legislation / SANS)
Listed: Mining residue disposal (tailings storage facilities, waste rock dumps, evaporation dams)	Erosion, altered topography, visual intrusion	Topography, soils	Operational	Preventive and rehabilitative	• Compliance with the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and Government Notice (GG) No. 704 on Water Management in the Mining Industry. • Outcome: stable slopes, no uncontrolled erosion, and landform blending with natural surroundings.
Not listed: Hydrocarbon and chemical handling (fuel storage, workshops, process chemicals)	Hydrocarbon leakage and contamination	Soil, groundwater	Operational	Preventive and corrective	• Compliance with the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA), Occupational Health and Safety Act, 1993 (Act 85 of 1993) (OHSA), and NEMA. • Outcome: no uncontrolled hydrocarbon discharge, proper hazardous waste disposal, and effective spill prevention.
Listed: Mine closure and rehabilitation (tailings storage facilities, waste rock dumps, evaporation dams)	Residual seepage, soil contamination, instability of rehabilitated landforms	Surface water, groundwater, soils	Decommissioning	Remedial	• Compliance with NEMA, the National Water Act, 1998 (Act 36 of 1998) (NWA), and NEMWA. • Outcome: safe, stable, and non-polluting rehabilitated landscape.
Listed: Infrastructure operation (ventilation fans, conveyors, plant machinery, vehicle movement)	Dust and noise emissions	Air quality, communities, fauna	Operational	Preventive and monitoring	• Compliance with NEMA, National Dust Control Regulations (2013), and South African National Standard (SANS) 10103:2008 (Noise). • Outcome: dust and noise levels within permissible thresholds and no significant nuisance to receptors.
Listed: Demolition of infrastructure (process plants, workshops, fuel bays)	Dust, asbestos exposure, waste contamination	Air quality, soils, communities	Decommissioning	Preventive and corrective	• Compliance with NEMA, NEM:WA, and OHSA (Asbestos Abatement Regulations, 2020). • Outcome: safe demolition, no uncontrolled dust or asbestos release, and licensed disposal of hazardous materials.
Listed: Habitat disturbance (shaft infrastructure, waste facilities, haul roads, evaporation dams)	Loss of biodiversity, habitat fragmentation, and risks to Conservation Important (CI) species (e.g., *Boophone disticha, Crinum bulbispermum*, African Marsh-harrier, Giant Bullfrog)	Flora, fauna, ecosystems	Operational	Preventive and enhancement	• Compliance with the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA) and NEMA. • Outcome: protect intact habitats, maintain ecological corridors, prevent further loss of CI species, and implement alien invasive control programmes.
Listed: Rehabilitation of disturbed areas (TSFs, Waste Rock Dumps,, pans, wetlands)	Residual ecological degradation, poor recovery of flora/fauna, invasive alien spread	Flora, fauna, wetlands, ecological corridors	Decommissioning	Remedial and enhancement	• Compliance with NEMBA, NEMA, and Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA). • Outcome: successful rehabilitation of grassland and wetland habitats, reinstatement of ecosystem services, and protection of Conservation Important species through propagation and reintroduction.
Listed: Employment and procurement (direct, indirect, and supply chain jobs)	Positive socio-economic upliftment	Communities, economy	Operational	Enhancement	• Compliance with the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) and Broad-Based Black Economic Empowerment Act, 2003 (Act 53 of 2003) (B-BBEE Act). • Outcome: sustained employment, skills development, and local procurement benefits.
Listed: Mine closure retrenchment and social transition	Job losses, economic vulnerability, social instability	Communities, economy	Decommissioning	Remedial and enhancement	• Compliance with the Labour Relations Act, 1995 (Act 66 of 1995), MPRDA, and B-BBEE Act. • Outcome: structured retrenchment processes, reskilling programmes, social transition support, and alignment with municipal Local Economic Development frameworks.

25.7 Impact Management Action

The table below sets out the specific actions to achieve the outcomes in Table 25-3. It identifies the activity, potential impact, detailed mitigation action, timeframe for implementation, and the compliance standards required.

Table 25-3: Impact Management Actions

Activity	Potential Impact	Mitigation Action (How)	Time Period for Implementation	Compliance with Standards and Legislation
Construction and operation of waste rock dumps, tailings storage facilities (TSFs), evaporation dams, and associated infrastructure	Permanent alteration of natural topography; erosion; altered drainage patterns; visual intrusion	• Develop and implement a Stormwater Management Plan, including drains, berms, trenches and energy dissipaters. • Conduct routine inspections and immediate repairs of erosion features. • Re-contour and shape dumps/dams progressively. • Establish indigenous vegetation to stabilise slopes.	Operational and Decommissioning Phases	• National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA). • National Water Act, 1998 (Act 36 of 1998) (NWA). • Government Notice 704 of 1999 (GN 704).
Excavation and operation of slimes dams, waste rock dumps, and evaporation dams	Soil sterilisation; salinisation; gulley erosion	• Strip and stockpile topsoil before disturbance. • Apply ≥300–500 mm topsoil cover during rehabilitation. • Apply lime/soil ameliorants to sodic soils. • Monitor soil salinity and erosion routinely; corrective action as required.	Operational and Decommissioning Phases	• NEMA. • NWA. • Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA).
Fuel storage, chemical handling, and waste disposal	Soil and groundwater contamination from hydrocarbons/chemicals	• Line and bund all fuel and chemical storage facilities to contain ≥110% of largest container. • Use oil separators, drip trays, and spill kits. • Train staff annually on chemical handling and spill response. • Excavate and bioremediate hydrocarbon-contaminated soils during closure. • Remove contaminated infrastructure to ≥1 m below ground where feasible.	Operational and Decommissioning Phases	• NWA. • NEMA. • Occupational Health and Safety Act, 1993 (Act 85 of 1993) (OHSA). • National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA).
TSFs and process plant operations	Contamination of surface and groundwater from seepage or chemical spills (cyanide, caustic, hydrocarbons)	• Bund and line all chemical storage tanks. • Implement hazardous substance handling procedures aligned with NWA and OHSA. • Conduct quarterly spill response drills. • Immediately clean spillages and transport contaminated materials to licensed hazardous facilities. • Conduct groundwater/surface water monitoring at compliance points.	Operational phase	• NWA. • OHSA. • NEMWA. • GN 704.
TSF decommissioning and rehabilitation	Long term seepage (sulphates, chlorides, uranium)	• Cap TSFs with ≥500 mm engineered cover. • Re-contour slopes to 1:4 or flatter. • Establish deep-rooted indigenous vegetation. • Install toe drains or passive wetlands if seepage persists. • Monitor groundwater/surface water for ≥5 years post closure.	Decommissioning Phase	• NWA. • NEMA. • Mine Health and Safety Act, 1996 (Act 29 of 1996) (MHSA).
Workshops, vehicle yards, and salvage yards	Hydrocarbon leaks, contaminated soils, improper waste management	• Confine all servicing to impermeable, bunded maintenance bays with oil/silt separators. • Train staff in spill response and waste segregation. • Maintain auditable waste register and safe disposal certificates. • Excavate contaminated soils and treat/bioremediate during closure. • Conduct final waste audits and closure verification sampling.	Operational and Decommissioning Phases	• NEMWA. • NEMA. • NWA. • OHSA.
Waste management (general and hazardous)	Contamination of soils and water from poor waste separation/disposal	• Implement Waste Management Plan. • Segregate general/hazardous waste at source into labelled, weatherproof containers. • Appoint licensed transporters/disposal facilities; verify licences annually. • Conduct quarterly toolbox talks and monthly site audits.	Operational and Decommissioning Phases	• NEMWA. • NEMA.
Water management facilities (dams, reticulation, dirty/clean water separation)	Overflows during storms, contaminated discharges	• Maintain capacity for ≥1:50 year storm events; demonstrate compliance via water balance. • Operate all dams below required freeboard. • Inspect embankments, spillways, and valves weekly. • No deliberate discharge of process water without lawful authorisation (NWA Section 21). • Monitor upstream and downstream compliance points.	Operational phase	• NWA. • GN 704. • NEMA.
Socio-economic	Employment risks; community impacts during closure	• Maintain Social and Labour Plan commitments. • Implement retraining/reskilling programmes during closure. • Prioritise local contractors for rehabilitation works. • Support local economic diversification initiatives (agriculture, renewable energy).	Operational and Decommissioning Phases	• Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA). • NEMA.

26 MONITORING

26.1 Groundwater Monitoring

Surface water and groundwater are monitored through a comprehensive programme designed to ensure compliance with the NWA and the WUL 08/C42K/AEFJG/8739 (dated 31 October 2018 and the subsequent amendment of 2021).

Groundwater monitoring is extensive, with more than thirty boreholes forming part of the network. These boreholes are categorised into background boreholes, receptor boreholes, and plume boreholes. Background boreholes are sampled annually to establish baseline conditions, while receptor boreholes are monitored quarterly to track potential risks to nearby users. Plume boreholes are monitored bi-annually to delineate and track the migration of contamination plumes. In addition to the core suite of physico-chemical and metal parameters, groundwater monitoring incorporates strict quality assurance and control procedures, including duplicate samples, split sampling, anion-cation balance checks, and, where needed, isotope analysis to distinguish natural water chemistry from anthropogenic influences.

26.2 Surface Water Monitoring

Surface water monitoring is undertaken at more than ten fixed points, including spruits, dams, pans, sewage sumps, and evaporation systems. Monitoring at spruits is generally conducted on a monthly basis, while quarterly sampling is carried out at larger impoundments. The parameters analysed include pH, EC, TDS, suspended solids, alkalinity, hardness, and a wide range of nutrients and ions such as nitrates, chlorides, fluorides, sulphates, and major cations. Metals such as iron, zinc, manganese, and aluminium are also routinely tested. These indicators provide a robust picture of water quality and enable the identification of any contamination from mine effluent discharges, stormwater runoff, or other operational activities.

26.3 Biomonitoring

Biomonitoring is undertaken on a bi-annual basis to provide a consistent measure of the health and functionality of aquatic and wetland ecosystems potentially affected by mining activities. This programme incorporates assessments of rivers, wetlands, seeps, and depressions, using recognised tools such as WET-HEALTH to determine PES, WET-EcoServices to evaluate the ecosystem services provided, and EIS assessments to identify biodiversity and conservation value.

The bi-annual frequency ensures that monitoring captures seasonal variation in flow, water quality, and ecological functioning, thereby providing a more accurate understanding of long term trends. Findings from each monitoring cycle are used to track changes in ecosystem condition, identify emerging risks, and guide adaptive management measures.

The biomonitoring programme will continue for the LoM to ensure ongoing compliance with the NWA and other regulatory requirements, as well as to support responsible environmental stewardship. This long term commitment ensures that ecological sensitivities are recognised and managed proactively, while providing assurance to regulators, stakeholders, and local communities that mining impacts are being monitored and mitigated.

26.4 Air Quality Monitoring

Air quality monitoring at Beatrix Mine is undertaken through a continuous dustfall monitoring programme, designed to quantify ambient dust deposition rates in accordance with the National Dust Control Regulations (2013) and the ASTM D1739 dustfall monitoring method.

26.4.1 Monitoring Network

The Beatrix air quality monitoring network consists of eight fixed non-residential dustfall monitoring stations, positioned to represent conditions around the operational footprint and in surrounding agricultural land. Each station is exposed for 30 ± 2 days, after which the dustfall bucket is replaced and the sample is sent to a SANAS-accredited laboratory for gravimetric analysis in accordance with ASTM D1739.

The monitoring points and their coordinates are provided in Table 26-1.

Table 26-1: Beatrix Dustfall Monitoring Stations and Coordinates

Monitoring Point	Locality Description	Latitude (S)	Longitude (E)	Classification
BOMMAN	Bomman Dust Fallout Stand	28.27167	26.75692	Non-Residential
HANEKOM	Hanekom Dust Fallout Stand	28.23053	26.80497	Non-Residential
JANSE VAN RENSBURG	Janse van Rensburg Dust Fallout Stand	28.16350	26.69925	Non-Residential
PINGO	Pingo Dust Fallout Stand	28.19378	26.72717	Non-Residential
PRETORIUS D	Pretorius D Dust Fallout Stand	28.30867	26.76408	Non-Residential
PRETORIUS J	Pretorius J Dust Fallout Stand	28.21681	26.70202	Non-Residential
UYS	Uys Dust Fallout Stand	28.29419	26.79811	Non-Residential
VD MERWE	Van der Merwe Dust Fallout Stand	28.15094	26.71206	Non-Residential

26.5 Noise Monitoring

Noise monitoring at Sibanye Gold is undertaken on an annual basis to ensure compliance with national legislation and South African National Standards. The monitoring is conducted in line with SANS 10328:2008 (methods for environmental noise impact assessments) and SANS 10103:2008 (measurement and rating of environmental noise with respect to annoyance and speech communication). These standards require measurements to be taken during the daytime (06:00–22:00) and night-time (22:00–06:00), with results compared against acceptable zone sound levels for different districts

Noise measurements are taken at four monitoring points located around the Beatrix Mine operations. These sites represented noise-sensitive receptors situated near operational shafts and nearby agricultural homesteads:

Monitoring Point	Location Description	Coordinates	Land Use Rating
NM1	No.4 Shaft – Resident 2	28°11'31.0"S; 26°43'37.1"E	Urban
NM2	No.4 Shaft – Resident 1	28°09'38.6"S; 26°42'00.5"E	Rural
NM3	No.3 Shaft – near farmhouse	28°13'43.1"S; 26°48'27.8"E	Rural
NM4	No.1 & 2 Shafts – Wynandsfontein Farm	28°17'38.8"S; 26°47'43.5"E	Rural

27 FINANCIAL PROVISION

The section below has been derived from the Closure Report for Beatrix Gold Mine compiled by Golder (Golder Associates Africa, 2021).

27.1 Determination of the Amount of Financial Provision

27.1.1 Describe the Closure Objectives and the Extent to Which They Have Been Aligned to the Baseline Environment Described Under the Regulation

The following closure objectives were formulated in 2020 to guide the implementation of closure measures at Beatrix (Golder Associates Africa, 2021):

- Establish a safe, physically stable, and as far as practicable, non-polluting rehabilitated landscape that minimises long term erosion risks and environmental degradation.
- Maintain long term catchment yield and protect water quality.
- Develop a functional post-mining landscape that supports agricultural practices where feasible.
- Integrate rehabilitated areas with ecological corridors and riparian zones, where possible.
- Facilitate, where appropriate, the re-establishment of terrestrial and aquatic wetland biodiversity over time.
- Create opportunities for alternative post-mining land uses and livelihoods, aligned with broader regional planning objectives.

27.1.2 Confirm Specifically that the Environmental Objectives in Relation to Closure Have Been Consulted with Landowner and Interested and Affected Parties

Initial public engagement meetings have been undertaken with stakeholders and I&APs to discuss the project and its closure objectives. These consultations aimed to:

- Gain a deeper understanding of the project-specific environmental context.
- Provide I&APs with clear and accessible information regarding the proposed project and associated closure objectives.
- Record, address, and respond to comments and concerns raised during the consultation period, with a summary of inputs documented for consideration in the closure planning process.

These engagements ensured that closure objectives and environmental management measures were communicated, considered, and refined in consultation with stakeholders.

27.1.3 Provide a Rehabilitation Plan that Describes and Shows the Scale and Aerial Extent of the Main Mining Activities, Including the Anticipated Mining Area at the Time of Closure

The rehabilitation and closure measures for infrastructural aspects are detailed in Table 26-1 below (Golder Associates Africa, 2021). This includes dismantling and demolition of infrastructure, rehabilitation of WRDs and TSFs, remediation of contaminated areas, and general surface rehabilitation to restore land for post-mining use.

Table 27-1: Site-specific closure measures for infrastructural aspects

Closure Cost Component	Closure Cost Allowances
Infrastructure areas	
Steel structures, reinforced concrete structures, offices, workshops, pump stations, buildings and related structures and infrastructure	• Dismantle and remove off-site heavy equipment for disposal or reuse at other operations, where feasible. • Demolish and remove steel structures (e.g., tanks, clarifiers, mills, thickeners, silos, crushers) to a dedicated decontamination bay; sort at the salvage yard for recycling. • Demolish concrete structures, plinths and bases to a depth of 1 m below ground level, including paved/walkway areas and bunded areas. • Demolish brick buildings/structures, offices and related buildings. • Rehabilitate resultant footprints as part of general surface rehabilitation.
Services and other linear infrastructure	• Fences: o Remove all fencing not required for the next land use. o Demolish all concrete foundations/supports to 1 m below ground level. o Rip tracks along fence lines and allow natural revegetation. • Power lines and pipelines: o Remove all on-site power lines, except the main feed lines to Eskom's substation. o Remove all operational surface pipelines; seal underground pipelines left in situ. • Railway lines: o Remove railway infrastructure; transport steel tracks to salvage yard, recover ballast for reuse. o Remove railway embankments constructed of waste rock to nearest WRD; profile and rehabilitate as required.
Roads	• Rehabilitate access and gravel roads, including internal mine roads, unless required for future land use.
Waste handling and disposal	• Recycle salvageable waste (e.g., steel) after decontamination. • Decontaminate and crush process-related concrete demolition waste on-site. • Remove inert demolition waste for backfilling/disposal at licensed sites. • Compile asbestos inventory and dispose asbestos at licensed facilities. • Transport hazardous/contaminated materials to Holfontein or other licensed sites.
Mining areas and processing residues	
Shafts, adits and inclines	• Plug shafts in accordance with standards (reinforced concrete plug, anchors, shuttering, beams, infill). • Shape/profile areas to be free-draining. • Rehabilitate footprints as part of general surface rehabilitation.
Waste/surface rock dumps	• Remove and transport remaining excess waste rock; consolidate at nearest dump. • Rehabilitate existing dumps in situ: shape slopes to 1:3, place 500 mm soil cover, establish vegetation, implement stormwater controls. • Rehabilitate resultant footprints.
Tailings storage facilities (TSF)	• Plug outlet and seal penstock. • Construct spillway for drainage.

Closure Cost Component	Closure Cost Allowances
	• Shape embankments to 1:4 or less; minor shaping of upper surface (~60% of beach). • Apply lime breaker layer. • Place ≥500 mm soil cover on outer slopes; use treated contaminated soil where possible. • Establish vegetation on slopes and surface with amelioration/fertiliser. • Implement stormwater routing.
Evaporation dams associated with tailings storage facilities	• Excavate sediment to 500 mm depth; haul to TSF for disposal. • Apply lime (20 t/ha) and rip soils. • Shape walls (~2 m) and profile dam surfaces. • Establish vegetation on disturbed areas.
Pollution control dams	• Remove contaminated soils/sediments; dispose on TSF. • Remove/shred HDPE liners. • Excavate soils (300 mm unlined, 150 mm lined dams). • Breach dam walls and reshape to 1:5. • Shape/level basins to free-draining. • Rehabilitate resultant footprints.
Boreholes and flares sites	• Demolish small ancillary buildings. • Plug boreholes to 5 m depth. • Remove and dispose HDPE liners. • Re-profile, rip and establish vegetation.
General surface rehabilitation	
Plant, infrastructural and mining facility footprints and	• Rip with agricultural equipment to ≥300 mm on disturbed/compacted areas to alleviate compaction.
Intermediate disturbed areas	• Rip compacted areas (hardstands, haul roads, WRD footprints) with construction equipment, then over-rip with agricultural equipment. • Shape/profile to emulate natural topography. • Establish vegetation with soil amelioration/fertiliser where required.
Preliminaries and general, contingencies and additional allowances	
Preliminaries and general	• Allowance of 6% of subtotal for infrastructural aspects.
Contingencies	• 7.5% for infrastructural aspects. • 7.5% for mining aspects. • 10% for general surface rehabilitation.
Additional allowances for specialist work and environmental	• Environmental Impact Assessment, Integrated Water and Waste Management Plan and Water Use Licence Application applications. • Radioactivity decommissioning studies. • Waste management plans. • Contaminated land assessments. • TSF geochemical characterisation. • Engineering cover and landform profiling designs. • Sinkhole rehabilitation planning and costs. • Stakeholder consultation and management plan development.
Post closure aspects	
Surface water and groundwater monitoring	• Conduct monthly surface water monitoring over a five-year period at monitoring points as indicated per operational area. • Conduct quarterly groundwater monitoring over a minimum five-year period at monitoring points as indicated per operational area.
Rehabilitation monitoring	• Conduct monitoring of rehabilitated areas for a minimum five-year period.
Care and maintenance of rehabilitated areas	• Conduct care and maintenance of the rehabilitated areas over a five-year period, with high intensity care and maintenance being conducted for the rehabilitated main plant and shaft areas, WRDs and TSFs as indicated.
Continued pumping of water at Titanic pump station	• Continue with pumping at Titanic - into underground workings for a period of 10 years (or for as long as demonstrated to be required based on monitored water quality), assuming an average yield of 1.2 Ml/day.

27.1.4 Explain Why It Can Be Confirmed that the Rehabilitation Plan Is Compatible with the Closure Objectives

The Rehabilitation Plan compiled by Golder (2021) directly supports Beatrix's closure objectives. Measures such as infrastructure removal, land reshaping, stabilisation, and revegetation have been designed to create a safe, stable, and non-polluting environment, while supporting productive post-mining land uses such as agriculture and biodiversity restoration.

The Plan is aligned with commitments in the approved EMPr, which specifies that land must be rehabilitated to support future beneficial uses. Flexibility has been built into the plan to allow final land uses to reflect prevailing economic conditions and community needs closer to decommissioning. This ensures long term compatibility with closure objectives and regulatory requirements, including GN R 1147.

27.1.5 Calculate and State the Quantum of Financial Provision Required to Manage and Rehabilitate the Environment in Accordance with the Applicable Guideline

The initial closure costing was prepared by Golder Associates in 2020, in line with GN R 1147. Following the extension of the mine's life to 2042, WSP updated the closure costing to incorporate current rates, assumptions, and site conditions. The updated closure cost for Beatrix 4 Shaft identifies a financial provision requirement of R482 156 121 (exclusive of VAT) as of March 2024.

Table 27-2: Unscheduled closure costs as at March 2024

Closure components	Unscheduled Closure (2024)
1 Infrastructural aspects	R132 363 240,05
2 Mining aspects	R207 556 341,60
3 General surface rehabilitation	R22 321 304,14
4 Surface water reinstatement	R2 733 672,49
Subtotal 1	R364 974 558,27
5 Ps&Gs, Contingencies and additional allowances	
5.1 Preliminary and general	R21 898 473,50
5.2 Contingencies	R27 726 099,04
5.3 Additional studies	R4 940 788,40
Subtotal 2	R54 565 360,93
6 Pre-site relinquishment monitoring and aftercare	
6.1 Surface water quality monitoring	R7 150 440,00
6.1.1 Post-decant surface water quality monitoring	R10 725 660,00
6.2 Groundwater quality monitoring	R2 882 314,30
6.2.1 Post-decant groundwater quality monitoring	R4 323 471,45
6.3 Rehabilitation monitoring of rehabilitated areas	R2 234 151,87
6.4 Care and maintenance of rehabilitated areas	R33 147 335,61
6.5 Additional TSF care and maintenance (low intensity) to align with NNR requirements post closure	R2 152 828,89
Subtotal 3	R62 616 202,12
Grand Total Excl. VAT (Subtotal 1 + 2 + 3)	**R482 156 121,32**

27.1.6 Confirm that the Financial Provision will be provided as Determined

The updated closure costing indicates that Beatrix 4 Shaft requires R482 156 121 (exclusive of VAT) for unscheduled closure. The DMPR currently holds a financial provision for the mine, which will be reviewed and adjusted as necessary to ensure adequacy.

27.1.7 Mechanisms for monitoring compliance with and Performance Assessment against the Environmental Management Programme and reporting thereon

Monitoring and performance assessment are carried out through a structured framework that combines legislated requirements, internal audits, and external oversight. The closure monitoring and reporting requirements are outlined in the Closure Plan and are refined periodically as site relinquishment criteria are finalised. This ensures that monitoring activities are not only aligned with regulatory obligations but also provide evidence of rehabilitation success prior to application for closure.

Operational monitoring requirements, such as those mandated by the WUL, remain in force during the transition from active operations into the post-mining period. However, the monitoring programme is adjusted at closure to ensure that it is appropriate for evaluating the effectiveness of rehabilitation measures. Compliance is tracked through the Environmental Management System (EMS), where audit findings are recorded, corrective actions assigned, and resources allocated to ensure effective close out.

To achieve this, a range of audits are undertaken to demonstrate performance against the EMPr. These include internal WUL audits (conducted annually), legal compliance audits (every two years), annual environmental performance audits, and annual ISO 14001 EMS audits. In addition, water audits in terms of GN 704 are conducted annually or biennially depending on requirements. External audits are also undertaken by closure and rehabilitation specialists to verify the Closure Plan and associated costs. Together, these mechanisms provide a continuous process of evaluation, corrective action, and assurance that closure objectives and EMPr commitments are being met.

27.1.8 Indicate the Frequency of the Submission of the Performance Assessment / Environmental Audit Report

The frequency of environmental audits and performance assessments is determined by both legislative requirements and operational needs. In general, most audits are conducted annually, with certain compliance audits, such as legal reviews, taking place every two years. Annual audits include the environmental performance audit, ISO 14001 EMS audit, and external Closure Plan and cost audit, while GN 704 water audits may occur annually or biennially. These audits are carefully scheduled to align with Beatrix’s financial year and budget cycle, ensuring that environmental obligations are integrated with operational and financial planning.

Formal auditing continues throughout the post closure monitoring period until a closure certificate is issued by the relevant authority. During this time, audit findings are documented within the EMS, corrective measures are identified and implemented, and progress is tracked to ensure effective rehabilitation outcomes. Although the frequency of non-legislated audits may be reduced in the post closure period, this is subject to consultation with stakeholders and regulatory authorities. This approach ensures that performance assessments and audit reports remain regular, transparent, and aligned with the mine’s closure and rehabilitation obligations.

28 EMERGENCY PREPAREDNESS AND RESPONSE

The Sibanye Gold Mandatory Code of Practice (COP) (Appendix G) sets out the requirements for emergency preparedness and response across Sibanye's operations. The COP is issued in terms of Section 9 of the MHSA and complies with the DMPR Guideline DMR 16/3/2/1-A5.

The primary purpose of the COP is to ensure that all reasonably foreseeable emergency situations that may threaten the health and safety of employees and other affected persons are adequately identified, planned for, and managed. It establishes a structured framework for the early detection of emergencies, effective communication, coordinated response, evacuation, rescue, medical care, and post-incident reporting.

The document is underpinned by a formal risk management process in accordance with Section 11 of the MHSA . Hazards associated with emergency situations are identified through baseline risk assessments, and control measures are developed following the hierarchy of controls, namely elimination, control at source, minimisation, and the use of personal protective equipment. The COP is subject to review following serious incidents, changes in operating conditions, or at least every five years.

Key emergency preparedness measures addressed include detection and early warning systems for fires, flammable gases, carbon monoxide, flooding, seismic events, and chemical releases; communication systems to ensure continuous contact between underground workings, control rooms, and external emergency services; and the provision of emergency medical care, including trained personnel, equipment, and response protocols.

The COP provides detailed procedures for mine evacuation and escape, including the use and management of self-contained self-rescuers, refuge bays, escape routes, and inter-shaft evacuation arrangements. Specific emergency scenarios are comprehensively covered, such as underground and surface fires, flammable gas explosions, total power failures, flooding or water inrushes, methane accumulation, missing persons underground, exposure to blasting fumes, heat disorders, fatal accidents, seismic events, chemical spillages, shaft accidents, compressed air failures, slimes dam failures, industrial action, and water shortages.

Clear roles and responsibilities are assigned to key personnel during emergencies, including control room operators, environmental engineering officials, mine overseers, operations and engineering managers, mine rescue services, medical services, and support functions. The establishment and operation of emergency control centres, record keeping, and communication protocols are also defined.

29 ENVIRONMENTAL AWARENESS PLAN

29.1 Manner in which the Applicant Intends to Inform His or Her Employees of Any Environmental Risk which may result from their Work

Sibanye Gold implements a structured training and awareness programme to ensure that employees and contractors understand the environmental risks associated with their work. All employees and contractors undergo mandatory induction training at the time of appointment, which is refreshed annually or as required by the Training Department. This training covers general environmental awareness, the responsibilities of employees and contractors under the EMS, and key compliance requirements in terms of environmental legislation and authorisations (Sibanye-Stillwater, 2024a).

The induction programme further includes training on the company's Environmental, Social and Governance (ESG) commitments, significant environmental aspects and impacts of mining activities, and site-specific requirements such as water use, waste handling, biodiversity protection, noise control, and land and soil management. These requirements are aligned with the EMPr, WULs and other applicable legislation. Employees are also informed of the benefits of environmental management and the potential consequences of non-compliance (Sibanye-Stillwater, 2024b).

In addition to general induction, operational awareness training is conducted annually for employees who carry out tasks with significant environmental aspects, such as waste management or water resource use. This training is delivered by the Environmental Team and may be supplemented by ad hoc, on-the-job competency training. Task-specific management training is also provided, focusing on topics such as environmental legislation updates and internal EMS audits. This is delivered either by the Environmental Team or by external service providers where specialist expertise is required (Sibanye-Stillwater, 2024a).

Through this tiered approach, Sibanye Gold ensures that all employees and contractors are consistently informed about the environmental risks associated with their roles, while also equipping operational and managerial staff with the specialist knowledge needed to mitigate these risks.

29.2 Manner in which Risks will be dealt with in Order to Avoid Pollution or the Degradation of the Environment

Sibanye Gold manages identified environmental risks by integrating training with procedural guidance and operational controls. Training modules include detailed information on significant environmental aspects and impacts, highlighting how daily operations may contribute to risks such as water contamination, waste mismanagement, noise pollution, or biodiversity loss. Employees are instructed on the specific measures required to minimise these impacts, as set out in approved procedures and environmental authorisations (Sibanye-Stillwater, 2024b).

The training also promotes a culture of compliance and responsibility by emphasising the benefits of sound environmental management and the consequences of non-compliance, both for the organisation and for individuals. For example, refresher programmes and toolbox talks reinforce behavioural expectations, such as reporting incidents, stopping unsafe practices, and following correct waste segregation or spill response procedures (Sibanye-Stillwater, 2024a).

At operational level, task-specific procedures are implemented to guide employees in risk management. These include measures for correct waste handling, monitoring water use, implementing dust and noise control, and ensuring archaeological and ecological resources are protected. Where required, external providers support specialist training to ensure continuous improvement and alignment with evolving legislation. The Applicant further monitors training outcomes through internal audits and reporting structures, ensuring that awareness translates into effective environmental performance (Sibanye-Stillwater, 2024b).

Through this integrated approach of induction, awareness, and task-specific training, supported by ongoing monitoring and reporting, Sibanye Gold seeks to minimise pollution, prevent environmental degradation, and uphold its commitments under its EMS and ESG Policy.

30 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No specific information has been requested by the DMPR in relation to this application.

31 UNDERTAKING

The EAP herewith confirms

a) the correctness of the information provided in the reports;

b) the inclusion of comments and inputs from stakeholders and I&APs;

c) the inclusion of inputs and recommendations from the specialist reports where relevant; and

d) that the information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by interested and affected. parties are correctly reflected herein.

31.1 Undertaking Under Oath/ Affirmation

I, Paula Jane Tolksdorff swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the registered Environmental Assessment Practitioner

GCS Environment South Africa (Pty) Ltd

Date: 14 January 2026

Signature of the Commissioner of Oaths:

Date: 14 January 2026

I certify that the DEPONENT has acknowledged that he/she knows and understands the contents of this affidavit, that he/she does not have any objection to taking the oath, and that he/she considers it to be binding on his/her conscience, and which was sworn to and signed before me

at Rivonia on this the 14 day of 1 20 26 and that the administering oath complied with the regulations contained in Goverment Gazette No. R1258 of 21 July 1972, as amended.

COMMISSIONER OF OATHS (RSA)
Wendy Sherriff CA(SA)
63 Wessel Road, Woodmead
Johannesburg

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Appendix A: Environmental Assessment Practitioner Curriculum Vitae

Appendix B: Hydrogeological Study for Beatrix Mine, compiled by SRK Consulting (SRK , 2019)

Appendix C: Biodiversity Baseline Assessment Report, Section D: Wetland Assessment, compiled by NSS (NSS, 2016b)

Appendix D: Biodiversity Baseline Assessment Report, Section C: Faunal Assessment, compiled by NSS (NSS, 2016a)

Appendix E: Beatrix Mining Areas of Sibanye Gold, Between Welkom and Theunissen, Lejweleputswa District, Orange Free State Province Heritage Study: Heritage Audit Report undertaken by PGS Heritage (Pty) Ltd. (PSG, 2017)

Appendix F: Water Use Licence 08/C42K/AEFJG/8739

Appendix G: Mandatory Code of Practice for Emergency Preparedness and Response

Appendix H: Public Participation Report