

# Integrated Water and Waste Management Plan for Klipspruit Colliery's Proposed Unwabu Project - Pit BD and Pit H Underground Mining Expansion Project (WU36905)

Prepared for

**Seriti Power (Pty) Limited**



## Document Detail

<b>Project Number:</b>	SER04	<b>Authority Reference:</b>	(WU36905)
<b>Report Title:</b>	Integrated Water and Waste Management Plan for Klipspruit Colliery's Proposed Unwabu Project - Pit BD and Pit H Underground Mining Expansion Project (WU36905)		
<b>Client Name:</b>	Seriti Power (Pty) Limited		
<b>EAP:</b>	Niara Environmental Consultants (Pty) Ltd		

## Document History

Revision	EAP/Author	Reviewed By	Date of Issue	Comments
0	Reborn Musie	Vumile Ribeiro	19 January 2026	

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## Executive Summary

This Integrated Water and Waste Management Plan (IWWMP) has been prepared for the Klipspruit Colliery's proposed Unwabu underground expansion, which comprises the development and operation of underground workings at Pits BD and H. The Unwabu project forms part of the Klipspruit life-of-mine plan and is situated within the existing Mining Right area. All surface infrastructure required to support the BD/H underground sections is already established and authorised; therefore, the project introduces no new surface disturbance and operates fully within the approved operational footprint of the mine.

The primary purpose of this IWWMP is to present a consolidated and regulatory-compliant water and waste management framework for activities associated with the underground expansion. It supports the mine's Water Use Licence (WUL) amendment application in terms of Section 21 of the National Water Act (NWA, Act 36 of 1998) and provides the technical basis for assessing, authorising and managing the newly triggered water uses, namely:

- 🌿 Section 21(j): Removal, discharge or disposal of water found underground in order to continue with mining operations;
- 🌿 Section 21(c): Impeding or diverting the flow of water in a watercourse; and
- 🌿 Section 21(i): Altering the bed, banks, course or characteristics of a watercourse as a result of subsurface mining below regulated areas.

These water uses arise exclusively from underground interactions with groundwater and the hydrological influence zones of wetlands, with no direct surface diversions or in-stream works proposed.

### Project Description and Operational Context

The Unwabu project involves the extension of bord-and-pillar underground mining into the BD and H compartments, using existing shafts, conveyors, pumps, haul roads, pipelines, power infrastructure and pollution control dams. Coal mined underground is conveyed to the existing Phola Coal Processing Plant (PCPP) for beneficiation, after which saleable product is transported via the established logistics network. The project has an estimated life of mine (LoM) of approximately 29 years, accommodating development, steady-state production, closure, and groundwater rebound.

Because all surface infrastructure is in place, the environmental impacts associated with Unwabu relate predominantly to:

- 🌿 groundwater inflows into underground workings,
- 🌿 potential hydrogeological influence beneath wetland ecosystems,
- 🌿 stormwater and dirty-water management around the BD/H surface footprints,
- 🌿 containment and routing of mine-affected water to pollution control dams, and
- 🌿 long-term groundwater rebound and post-closure water behaviour.

No new residue stockpiles, discard facilities, dams, diversions or processing infrastructure are required.

## **Hydrological and Hydrogeological Environment**

Klipspruit Colliery is located within Quaternary Catchments B11F, B20F and B20G, which drain toward the Wilge and Olifants River systems. The area's hydrology is characterised by a mix of hillslope seepage wetlands, valley-bottom wetlands and incised drainage lines. Several wetlands occur above or in proximity to the BD and H underground mine blocks. While the Unwabu project does not disturb these wetlands directly, the IWWMP assesses potential interactions resulting from underground drawdown and dewatering.

Groundwater inflows to underground workings are expected and have been incorporated into the site-wide water balance. All ingress water is collected in underground sumps and pumped to surface, entering the existing dirty-water reticulation system before being transferred to PCD4. No direct discharge of mine-affected water to the environment is proposed or permitted.

## **Water and Waste Management Strategies**

The IWWMP sets out integrated management strategies addressing clean water, dirty water, groundwater, stormwater, process water and waste, aligned with GN 704, the Environmental Authorisation, the EMPr, and the Storm Water Management Plan (SWMP). Key elements include:

- 🌿 Clean Water Management: Maintaining diversion berms and channels to ensure clean runoff bypasses operational areas.
- 🌿 Dirty Water Management: Full containment of all mine-affected water within sumps, engineered channels, and pollution control dams (PCDs).
- 🌿 Groundwater Management: Continuous pumping of underground inflows and comprehensive monitoring of groundwater levels and chemistry.
- 🌿 Stormwater Management: Implementing SWMP-designed structures to safely convey peak storm events, prevent erosion and maintain clean/dirty separation.
- 🌿 Process Water Management: Maximising reuse of PCD water for operational needs and limiting freshwater abstraction.
- 🌿 Waste Management: Compliant handling, storage and disposal of hazardous and general waste, with no new residue facilities introduced.
- 🌿 All water management actions reinforce the mine's zero-effluent discharge philosophy.

## **Monitoring, Performance, and Compliance**

A structured monitoring programme supports the implementation of the IWWMP. The programme includes:

- 🌿 groundwater monitoring (levels and quality),
- 🌿 surface water and wetland monitoring,
- 🌿 salt load tracking,
- 🌿 stormwater infrastructure inspections,

- biomonitoring where required, and
- process and dirty-water system monitoring (PCDs, sumps, berms, channels and pumps).

The IWWMP incorporates the requirements of the WUL, EA and EMPr, including specific actions mandated in the regulatory records of decision. An annual audit is required to verify the adequacy of the management actions and confirm compliance with all WUL conditions.

### **Action Plan**

A comprehensive and auditable Action Plan (Section 7.6) forms the operational backbone of this IWWMP. It includes over 70 discrete responsibilities assigned to relevant departments, along with performance indicators, frequencies and reporting requirements. The Action Plan is reviewed annually to ensure relevance, responsiveness and alignment with operational changes.

### **Assessment of Alternatives and the No-Go Option**

The underground expansion leverages existing infrastructure and introduces no new surface impacts. The “No-Go” alternative would result in:

- sterilisation of a significant underground coal resource,
- premature closure of the Klipspruit operation,
- reduced employment and procurement opportunities,
- no environmental advantage beyond current conditions, and
- long-term socio-economic losses for the region.

Given that environmental risks can be appropriately managed through the mitigation and monitoring measures proposed, the No-Go option is not preferred.

### **Conclusion**

This IWWMP demonstrates that the proposed Unwabu underground expansion at Klipspruit can be undertaken in a manner that is environmentally responsible, technically sound, and aligned with the requirements of the National Water Act, GN 704, GN R267, the Environmental Authorisation, and best-practice water management principles. With the implementation of the strategies, controls and monitoring programmes detailed within this Plan, the project is expected to operate without unacceptable impacts on surface water, groundwater, wetlands or downstream users.

The IWWMP provides a robust, integrated and adaptive framework that will guide water and waste management throughout the life of the BD and H underground mines, ensuring the protection of water resources and the maintenance of compliance with all regulatory obligations.

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## Glossary

Term	Definition
<b>Aquifer</b>	A geological formation or group of formations capable of storing, transmitting, and yielding groundwater to boreholes or springs.
<b>Affected Water / Mine-Affected Water</b>	Water that has come into contact with mining activities or disturbed surfaces, including dirty water, ingress water and contaminated stormwater.
<b>Baseflow</b>	The sustained contribution of groundwater to surface water systems such as streams, rivers or wetlands.
<b>Berm</b>	An engineered earth embankment designed to divert clean water, separate clean and dirty water, or prevent runoff from entering mining areas.
<b>Biodiversity</b>	The variety and variability of living organisms and ecological complexes in terrestrial and aquatic environments.
<b>Bord-and-Pillar Mining</b>	An underground mining method in which coal is extracted in "bord" (rooms) while leaving behind pillars of coal to support the roof. The method is used for Pit BD and H.
<b>Catchment</b>	A geographical area that drains into a surface watercourse, wetland, or groundwater system. Klipspruit falls within B11F, B20F and B20G.
<b>Clean Water</b>	Water that has not been contaminated by mining activities and is suitable for release into the environment or natural drainage channels.
<b>Compliance Point</b>	A designated monitoring location at which environmental quality must meet regulatory or licence thresholds.
<b>Contaminated Water / Dirty Water</b>	Water that has interacted with mining areas, coal surfaces, waste materials or other disturbed areas, requiring containment under GN704.
<b>Dewatering</b>	The removal of groundwater entering underground workings to maintain safe mining conditions. This constitutes a Section 21(j) water use.
<b>Discharge</b>	The release of water into a watercourse, including via pipeline, canal, or drains. Discharges are regulated under Section 21(f) and (h).
<b>Dirty Water System</b>	Engineered infrastructure that captures, conveys, and stores mine-affected water, including sumps, channels and Pollution Control Dams (PCDs).
<b>Drawdown</b>	The lowering of groundwater levels due to dewatering or abstraction.
<b>Ecological Importance and Sensitivity (EIS)</b>	A measure of an aquatic ecosystem's conservation value and sensitivity to disturbance.

Term	Definition
<b>Environmental Authorisation (EA)</b>	Approval issued in terms of NEMA for listed activities associated with mining and related operations.
<b>Environmental Management Programme (EMPr)</b>	A document describing measures to prevent, manage or rehabilitate environmental impacts associated with mining operations.
<b>Evapotranspiration (ET)</b>	Loss of water from land surface through evaporation and plant transpiration.
<b>Freeboard</b>	The vertical distance between the maximum allowable water level in a PCD and the top of the dam wall, required to prevent overtopping.
<b>Floodline</b>	The horizontal extent of flooding that would occur during a specific flood event, such as the 1:100-year flood.
<b>Groundwater</b>	Water located beneath the Earth's surface in soil pores and rock fractures.
<b>Groundwater Ingress</b>	Water entering underground workings via natural fractures, faults, or permeable coal seams.
<b>Hydraulic Conductivity</b>	A measure of how easily water moves through a porous medium such as soil or rock.
<b>Hydrogeology</b>	The study of groundwater occurrence, movement and interaction with geology.
<b>Hydrology</b>	The study of the distribution, movement and properties of surface water.
<b>Integrated Water and Waste Management Plan (IWWMP)</b>	A regulatory planning document required for Water Use Licence Applications (WULAs), describing water and waste management strategies, monitoring, and compliance.
<b>Life of Mine (LoM)</b>	The total expected lifespan of a mining operation from development to closure and post-closure monitoring.
<b>Mine-Affected Water</b>	Water impacted by mining operations, including contact water, dirty water, contaminated stormwater, and groundwater ingress.
<b>Monitoring Borehole</b>	A borehole used exclusively for monitoring groundwater levels and quality, not for abstraction.
<b>National Water Act (NWA)</b>	South Africa's primary water-resource legislation governing water uses, water protection, and licensing.
<b>No-Go Alternative</b>	A scenario in which the project does not proceed, evaluated to understand environmental and socio-economic consequences.
<b>PESEIS (Present Ecological State / Ecological Importance and Sensitivity)</b>	An assessment method used to determine the health and importance of aquatic ecosystems.
<b>Phola Coal Processing Plant (PCPP)</b>	The beneficiation facility used by Klipspruit for processing coal mined from underground operations.

<b>Term</b>	<b>Definition</b>
<b>Pollution Control Dam (PCD)</b>	A containment dam designed to store dirty water, mine-affected water, and stormwater runoff from disturbed areas.
<b>Process Water</b>	Water used for mining operations, including coal washing, dust suppression, drilling and underground activities.
<b>Riparian Habitat</b>	Vegetation and ecological zones adjacent to rivers, drainage lines or wetlands.
<b>Runoff</b>	Water flowing over land as a result of precipitation that does not infiltrate into the soil.
<b>Section 21 Water Uses</b>	Activities defined in the NWA that require registration or licensing, including dewatering, altering watercourses and storing water.
<b>Sump</b>	A low-lying area or pit used to collect dirty water or groundwater ingress prior to pumping.
<b>Surface Water</b>	Water on the Earth's surface, such as streams, rivers, wetlands and dams.
<b>Stormwater</b>	Precipitation runoff from rainfall events, which may be clean or contaminated depending on the surface it flows across.
<b>Storm Water Management Plan (SWMP)</b>	A technical plan outlining stormwater control measures to maintain GN704 compliance and protect water resources.
<b>Total Dissolved Solids (TDS)</b>	The total concentration of dissolved substances in water, used as an indicator of salinity.
<b>Turbidity</b>	A measure of suspended particles in water, indicating the clarity of water.
<b>Valley-Bottom Wetland</b>	A wetland located along the lowest part of a valley floor, typically fed by both groundwater and surface runoff.
<b>Water Balance</b>	An accounting framework assessing inflows, outflows and storage within the mine water system.
<b>Watercourse</b>	As defined in the NWA, including rivers, streams, drainage lines and wetlands.
<b>Wetland</b>	Land saturated with water long enough to support characteristic vegetation and hydrological processes.
<b>Wetland Hydropedology</b>	The study of water movement through soil profiles in wetland environments.
<b>WULA (Water Use Licence Application)</b>	An application to the DWS for authorisation of Section 21 water uses.
<b>Zero-Effluent Discharge</b>	A water management approach ensuring no mine-affected water is discharged to the environment.

## List of Abbreviations and Acronyms

Acronym / Abbreviation	Definition
°C	Degrees Celsius
BID	Background Information Document
BMH	Bulk Materials Handling
BPGs	Best Practice Guideline
CMA	Catchment Management Agency
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIS	Ecological Importance and Sensitivity
ELUs	Existing Lawful Water Uses
EMPr	Environmental Management Programme Report
ESA	Ecosystem Services Assessment
ESOP	Employee Share Ownership Programme
EWRP	eMalahleni Water Reclamation Plant
GA	General Authorisation
GN	Government Notice
Ha	Hectare
HGM Units	Hydro-geomorphic Units
IWULA	Integrated Water Use License Application
IWWMP	Integrated Water and Waste Management Plan
Km	Kilometers
KPS	Klipspruit Colliery
KPSS	Klipspruit South
KPSX	Klipspruit Extension
LED	Local Economic Development

<b>LEDP</b>	Local Economic Development Policy
<b>LoM</b>	Life of Mine
<b>M</b>	Metres
<b>Mamsl</b>	Metres Above Mean Sea Level
<b>MAR</b>	Mean Annual Runoff
<b>MPRDA</b>	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
<b>NEM: WA</b>	National Environmental Management: Waste Act (Act No. 59 of 2008)
<b>NEM</b>	National Environmental Management: Act (Act No. 107 of 1998)
<b>NWA</b>	National Water Act (Act No.36 of 1998)
<b>NWRS</b>	National Water Resource Strategy
<b>PCD</b>	Pollution Control Dam
<b>PES</b>	Present Ecological Status
<b>ROM</b>	Run of Mine
<b>RWQO</b>	Resource Water Quality Objectives
<b>SANS</b>	South African National Standards
<b>SAWS</b>	South African Weather Service
<b>SMS</b>	Source-Pathway-Receptor
<b>SPR</b>	Social and Labour Plans
<b>SPLUMA</b>	Spatial Planning and Land Use Management Act, 2013
<b>SR</b>	Scoping Report
<b>STP</b>	Sewage Treatment Plant
<b>WURMS</b>	Water User Registration Management System
<b>WMA</b>	Water Management Area
<b>WRCS</b>	Water Resource Classification System
<b>WUL</b>	Water Use License
<b>WULA</b>	Water Use License Application

# 1 Introduction

Seriti Power (Pty) Ltd ("Seriti Power") previously known as South32 SA Coal Holdings (Pty) Ltd is the holder of a Mining Right for coal in respect of its Klipspruit Colliery ("KPS") operation issued under the Department of Mineral Resources and Energy ("DMRE") (Ref No. MP 30/5/1/2/2/125 MR). Niara Environmental Consultants (Pty) Ltd was appointed by Seriti Power to compile an integrated Water and Waste Management Plan (IWWMP) Klipspruit Colliery for the proposed "Nwabu project" (to convert the mining method for KPSX and KPSS from opencast ("OC") to underground ("UG") bord and pillar mining).

KPS consists of three mining areas under a single Mining Right. These areas are referred to as:

- KPS Main Pit which includes the Main Pit, Smaldeel and Bankfontein Pits;
- "KPSX" or Klipspruit Extension Weltevreden including Pit BD, Pit H, Pit G and Pit S; and
- "KPSS" or Klipspruit South which includes the KPSS East of the Thungela conveyor and the KPSS West of the Thungela conveyor.

The purpose of this IWWMP is to present a comprehensive assessment of the water uses, water management systems, and associated environmental risks linked to the proposed underground expansion of Pit BD and Pit H at the Klipspruit (KPSX) operation, collectively referred to as Project Unwabu. The project forms part of Seriti Power's ongoing mining activities within the Klipspruit Mining Right area and relies entirely on existing surface infrastructure, established pollution control facilities, and the current mine water management network.

While no new surface infrastructure is proposed as part of the Unwabu expansion, the activation of the BD and H underground workings introduces new operational water interactions that require authorisation in terms of the National Water Act (Act 36 of 1998). These include the dewatering of newly accessed underground areas and the subsurface encroachment of mining beneath wetland systems, both of which trigger specific water uses under Section 21 of the Act. As such, this IWWMP provides the technical foundation for a Water Use Licence (WUL) amendment application.

This report aligns with the requirements of the 2016 Department of Water and Sanitation (DWS) IWWMP Guideline, ensuring that all relevant environmental, hydrological, hydrogeological, operational and waste management considerations are integrated into a single, coherent management framework. The IWWMP also interfaces with the mine's approved Environmental Management Programme (EMPr), existing WUL conditions, and the broader lifecycle planning for the Klipspruit Colliery. Through this integrated approach, the document demonstrates the mine's commitment to responsible water stewardship, regulatory compliance, and the protection of downstream users and sensitive environmental receptors.

The chapters that follow provide a detailed project description, an assessment of baseline water resource conditions, the identification and motivation of water uses triggered by the Unwabu underground expansion, and an evaluation of water and waste management measures currently in place. The report concludes with recommendations aimed at strengthening compliance, improving operational efficiency, and ensuring that water-related risks are effectively managed throughout the life of the project.

## 1.1 Activity Background

KPS Main Pit holds an Environmental Management Programme Report ("EMPr"), converted in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) ("MPRDA") and approved on 14 September 2010 and the EMPr for KPSS and KPSX (Pit BD) which was approved on 17 August 2017. KPS was further awarded an Environmental Authorisation ("EA") for the Opencast ("OC") mining of Pit H. In 2023, an EA was granted for the OC mining of Pit G & S.

In October 2022, KPS was granted a Section 102 ("S102") amendment approval to convert the mining method for KPSX and KPSS from OC to underground ("UG") bord and pillar mining. A subsequent EA amendment application was submitted to the DMRE on 18th August 2023 for the conversion of the mining method from OC to UG within KPSX named Pit BD, with approval pending.

KPS intends to apply for a change in mining method for the remainder of the KPSX and KPSS reserves from OC to UG, including all future mining areas of KPSX beyond Pit BD and inclusive of Pit H, termed as the "Nwabu Project." The application process involves Basic Assessment ("BA") as per Chapter 4 of GNR 326 under NEMA regulations. Additionally, Seriti Power is required to apply for a Water Use Licence for the proposed amendments, in terms of Section 21 of the National Water Act, 1998 (Act No. 36 of 1998).

This IWWMP is designed to address the activities associated with the Klipspruit Colliery "Nwabu Project" and its related activities.

## 1.2 Project Applicant

The Applicant is Seriti Power (Pty) Ltd. Seriti is a broad-based, 91% black-owned and controlled South African energy company, underpinned by coal. Klipspruit is an opencast mine located 5km from Ogies and Phola Township. The new KPSX Project is situated 7km from Ogies and 2km from Phola. It produces 2.4Mtpa for Eskom, 0.35Mtpa for the domestic market and around 5.1Mtpa of bituminous thermal coal for the export market.

Seriti Power details are captured in the table below.

**Table 1-1: Applicants Details**

<b>Name of Applicant:</b>	Seriti Power (Pty) Ltd (previously known as South32 SA Coal Holdings (Pty) Ltd)
<b>Registration No:</b>	1963/000537/07
<b>Responsible Person:</b>	Moyahabo Jumbo Makgalefe Lead Health Safety & Environment
<b>Physical Address:</b>	<u>Klipspruit Colliery:</u> Portion 12, Farm Klipfontein 3Registration Division IS Ogies, 2230 South Africa
<b>Postal Address:</b>	15 Chaplin Corner Oxford and Chaplin Roads

	Illovo 2196
<b>Telephone No:</b>	013 689 4620
<b>Email:</b>	<a href="mailto:Moyahabo.Makgalefe@seritiza.com">Moyahabo.Makgalefe@seritiza.com</a>

### 1.3 Details of the EAP

Niara Environmental Consultants (Pty) Ltd (Niara) has been appointed as an Independent Environmental Assessment Practitioner (EAP) by Seriti Power to undertake the BA process in support of an EA application, and an Integrated Water Use Licence Application (IWULA).

Founded by Vumile Ribeiro, Niara Environmental Consultants (Pty) Ltd is a 100% black female owned organisation. Our focus is environmental management services, integrated water resources management, biophysical studies as well as social issues and processes. Our key management personnel have accumulated vast experience in environmental management, integrated water resources management, mine closure and rehabilitation, and related fields. We assist our clients and communities they operate within in recognising that a healthy natural resource base is essential for economic self-sufficiency and that it provides opportunities for future livelihood options. Integral to this approach, is the need to educate our clients about the impact of their activities on their environment.

The details of the EAP are captured in **Table 2** below.

**Table 1-2: EAPs Details**

<b>Name of Practitioner:</b>	Vumile Ribeiro
<b>Registration No:</b>	2019/1183
<b>Responsible Person:</b>	Niara Environmental Consultants (Pty) Ltd
<b>Physical Address:</b>	Office 1 Palm Place Office Park 22 Bram Fischer Drive, Linden, Johannesburg 2195
<b>Postal Address:</b>	28 Shamrock Street, Ferndale, Randburg, Johannesburg 2194
<b>Telephone No:</b>	+27 82 767 2786
<b>Email:</b>	<a href="mailto:vumile@niara.co.za">vumile@niara.co.za</a>

## 1.4 Expertise of the EAP

**Vumile Ribeiro** has 18 years of professional and international experience in Environmental Assessment and Management primarily in the minerals resources and energy sector. She has extensive experience in compiling Environmental Impact Assessments and Water Use Licence Applications for mining, electricity supply (generation, transmission and distribution), road infrastructure, as well as water management projects. Her roles include the operational management responsibilities of Niara Environmental Consultants, project management, report writing, client liaison, as well as business development.

Having worked for a multi-disciplinary advisory firms and environmental consultancies, she has a competent understanding of the work effort and cross collaboration required for a successful multidisciplinary organisation. Vumile has been involved in a number of EIAs and has a particular interest in health impacts assessments, water resource management, mining, energy and stakeholder engagement. Vumile has considerable experience across a range of developmental and environmental sciences and has worked in South Africa, Mozambique, the DRC, Sierra Leone and Liberia and is familiar with Regulatory Environmental Legislation in other parts of Africa. Vumile is very well versed in the IFC Environmental and Social Performance Standards and the associated Equator Principles, which have informed the approach and standard for a number of ESIA processes that she has been involved in.

**Nolwazi Dlamini** is an environmental professional who has more than two (2) years of experience working in the Environmental Management field. She currently holds the title of junior environmental consultant at Niara Environmental Consultants (Pty) Ltd. She has more than one (1) year working as an Environmental Assessment Practitioner (EAP) in the mining sector where she has performed numerous environmental assessments (Environmental audits, financial provision & WML applications), Water Use Licence Application (WULA) as well as Basic assessment reports (BAR), Scoping and Environmental impact assessment(S&EIA) and Environmental management programmes (EMPr). One (1) year working as an Environmental Consultant in the petroleum industry where she worked under a Air quality specialist and was responsible for environmental compliance monitoring for Engen depots and Retail sites (EA & EMP); Retail & commercial site EIA gap closure monitoring; Air emission (AEL) & water use License (WUL) compliance as well as preparing internal environmental procedures (Air emission, waste, environmental safety). She is a seasoned Environmental Assessment Practitioner with a thorough understanding of the potential environmental and social impacts of activities in a variety of environmental settings. Her core competencies include research and report writing, specialist report review and environmental impact assessments.

## 1.5 Location of Overall Activity

The Klipspruit (KPS) operation, including the Unwabu underground expansion at Pits BD and H, is situated approximately 10 km southwest of Ogies and in close proximity to the town of Phola, within the eMalahleni Local Municipality of the Nkangala District Municipality, Mpumalanga Province. The operation falls within a well-established mining and industrial region characterised by extensive coal mining, coal processing facilities, energy generation infrastructure, and associated support services.

Project Unwabu is located entirely within the existing Klipspruit Mining Right area, which is demarcated by a combination of privately owned agricultural properties and areas historically disturbed by mining. The mining right covers several farm portions, including Tweefontein 623 JS, Weltevrede 624 JS, Klipfontein 81 JS, Wildebeestfontein 327 JS, Bankfontein 210 IR, and Prinsloop 2 IS, among others. These cadastral units form the spatial foundation for both surface and underground operations. The underground expansion will occur beneath these legally authorised areas, utilising established access points and infrastructure without altering the surface footprint.

Regionally, the project is situated within the Upper Olifants River Catchment, a priority water management area due to its ecological sensitivity, concentration of water users, and the presence of downstream strategic water sources. The area is characterised by a mix of hillslope seepage wetlands, channelled valley-bottom wetlands, ephemeral drainage lines, and modified riparian corridors, many of which have been historically influenced by mining and agricultural activities. These systems form integral components of the local hydrology and are key considerations for both the IWWMP and WUL.

The operation is bordered and traversed by major infrastructure networks, including the N12 national route, regional roads such as the R545 and R555, and several Eskom transmission lines that support the coal-energy value chain in the region. The Transnet rail corridor connecting the Highveld coalfields to the RBCT also runs adjacent to the mine, enabling efficient export logistics. Surrounding communities, including Phola, Ogies and smaller rural settlements, form part of the socio-economic landscape influenced by mining operations, underscoring the importance of robust environmental and water management practices.

The broader regional context is therefore one of intense industrial activity combined with environmentally sensitive water resources. The location of Project Unwabu within this setting emphasises the need for integrated, compliant and adaptive water management, particularly in the protection of wetlands, groundwater systems and downstream users.

KPSX, also known as Klipspruit Extension Weltevrede, is located 6 km from Ogies and 2 km from Phola. The colliery falls within the Olifants Water Management Area 2, within quaternary catchments B20G. These catchments are part of the greater Wilge River Catchment, which feeds into the Loskop Dam Catchment. The Wilge River flows in a northerly direction. Refer to Figure 1-1 for regional setting.

KPS is situated within the Witbank Coalfield, where it exploits coal seams within the Vryheid Formation of the Eccca Group, a unit of the Karoo Supergroup. The geological sequence in the KPS project area includes the Eccca Group and the underlying Dwyka Group.

Table 1-3 provides the location for which the proposed project will be undertaken. Figure 1-2 provides local setting of affected farm portions over existing and proposed infrastructure.

**Table 1-3: Activity Location**

<b>Farm Name:</b>	Hartebeestlaagte 325 JS, and Tweefontein 328 JS
<b>Magisterial District:</b>	Nkangala District Municipality
<b>Distance and Direction from Nearest Town:</b>	Approximately 6km north of Ogies town.

<b>21 Digit Surveyor General Code for each Farm Portion</b>	T0JS00000000032800005
	T0JS00000000032800008
	T0JS00000000032500040

The land tenure map provides an overview of the cadastral layout and property ownership associated with the Klipspruit (KPS) mining right area and the footprint of the Unwabu Project, including Pits BD and H. The map overlays farm portions, cadastral boundaries, and mining areas onto recent aerial imagery, allowing for a clear understanding of how the proposed underground workings relate to surrounding land parcels and surface land uses.

Refer to Figure 1-2. The KPS Mining Right boundary is shown in light blue and encompasses several farms, including Tweefontein 623 JS, Weltevrede 624 JS, Wildebeestfontein 327 JS, Prinsloop 2 IS, Bankfontein 210 IR, Klipfontein 81 JS, Grootpan 5 IS, and Zwaaiwater 11 IS, among others. These cadastral units collectively form the spatial framework within which both historical and proposed mining activities occur. The map clearly distinguishes between different operational areas within the mining right, such as the main open-cast pit, KPSX open-cast mining areas, and KPSX underground mining areas. The underground mining areas, including Pit BD and Pit H, are highlighted to show their relation to the broader mining complex and to adjacent land parcels.

Portions of land directly affected by mining operations, including those accommodating infrastructure, access roads, and areas of active or planned mining, are marked in contrasting colours. This enables the reader to easily differentiate between open-cast and underground sectors. Areas such as Portion 14 OC, OC Pit G&S, and the KPS Main OC Pit are shown in distinctive colours to illustrate their proximity to residential, agricultural and industrial land uses. The settlements of Phola and Ogies are located adjacent to the mining right area, emphasising the importance of robust environmental and water management practices, given the close interface between mining activities and local communities.

The farms surrounding the mining right area are outlined in gold, providing an understanding of the broader agricultural landscape and the interface between mining and neighbouring landowners. These delineations are important for assessing potential land-use conflicts, evaluating access needs, and understanding cumulative environmental impacts. The distribution of farm boundaries further illustrates that the proposed underground mining occurs largely beneath privately owned agricultural land, highlighting the need for careful consideration of subsurface rights and potential interactions with surface land uses.

Overall, the land tenure map provides a detailed and integrated view of the cadastral, operational and environmental layout of the KPS mining area. It supports the IWWMP by contextualising where mining-related water uses occur in relation to property boundaries, existing operations and neighbouring communities. This spatial understanding forms an essential foundation for evaluating environmental sensitivities, land-use compatibility, and the regulatory compliance requirements associated with Project Unwabu.

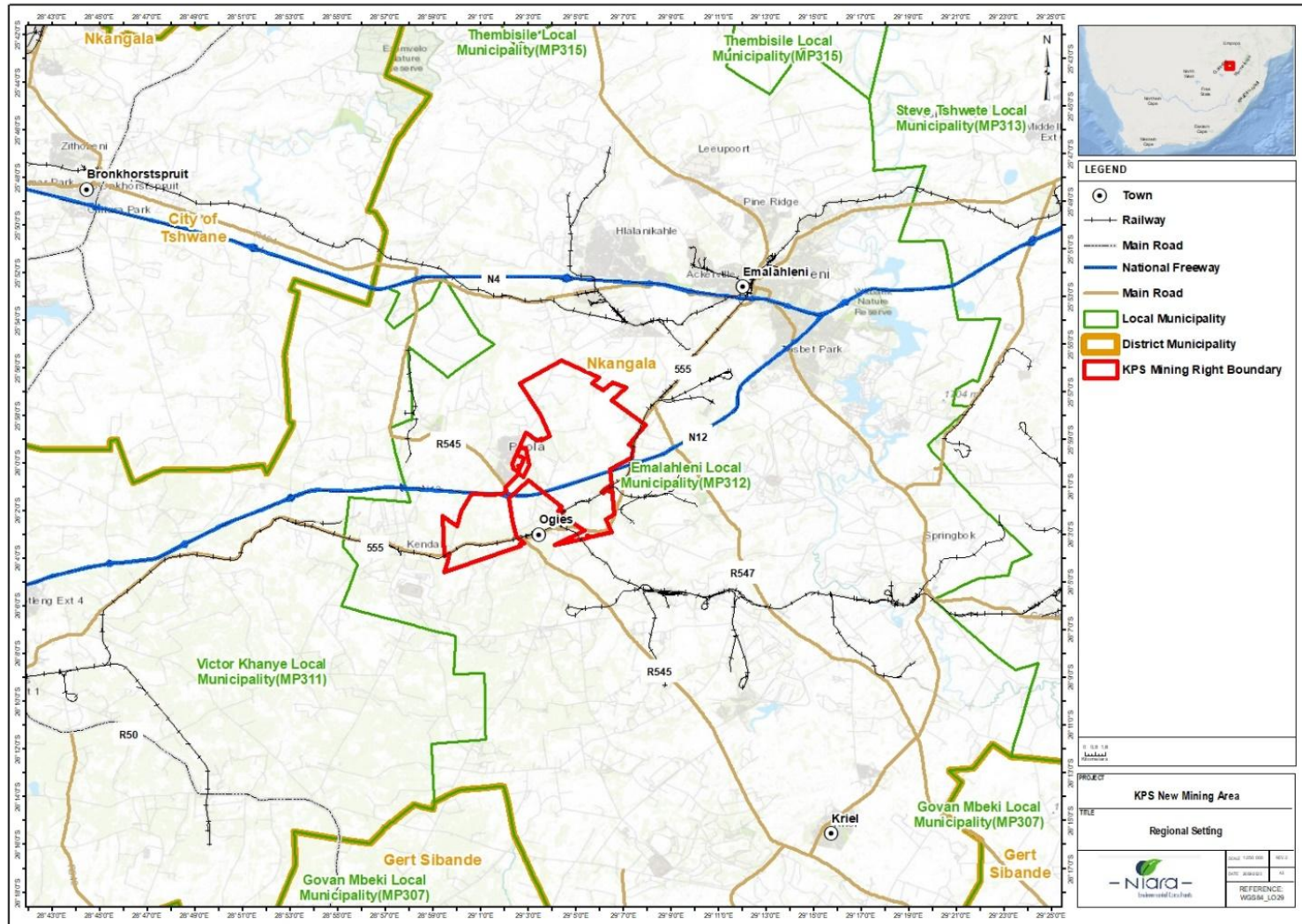


Figure 1-1: Locality Map

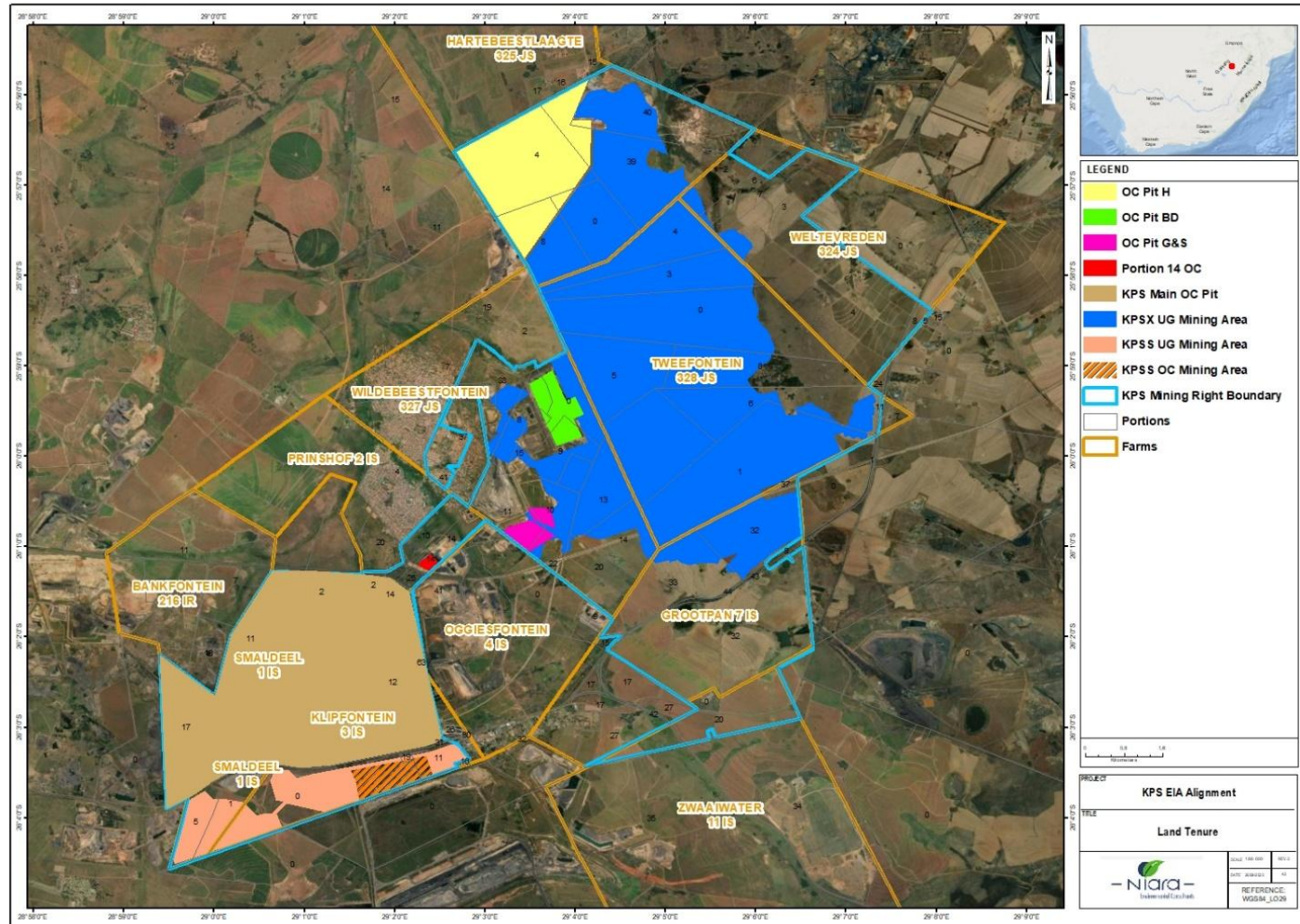


Figure 1-2: Affected farm portions over existing and proposed UG mining areas

### 1.5.1 Property Description

The KPS operation, including the Unwabu underground expansion at Pits BD and H, is situated within a cluster of agricultural and mining-influenced properties forming part of the Klipspruit Mining Right area. The mining right extends across several farm portions in the Mpumalanga coalfields, all of which form the legal and spatial basis for both surface infrastructure and underground mining activities.

The mining right area includes portions of the farms Tweefontein 623 JS, Weltevrede 624 JS, Wildebeestfontein 327 JS, Prinsloop 2 IS, Bankfontein 210 IR, Grootpan 5 IS, Zwaiwater 11 IS, and Klipfontein 81 JS, among others. These cadastral parcels are depicted in the accompanying property layout plans and represent a mixture of privately owned agricultural land and areas that have been historically disturbed by open-cast and underground mining. The underground workings associated with Project Unwabu occur entirely within these authorised properties and do not introduce any expansion beyond the approved mining right boundary.

Each property within the mining right carries specific land-use rights and ownership arrangements, which have been considered in the planning of the underground expansion. Land is predominantly zoned for agricultural use, though extensive areas have transitioned to mining-related land use through lawful authorisation and land access agreements. Existing surface infrastructure—including conveyor servitudes, access roads, laydown areas, ventilation sites, and water management facilities—is already fully established within these properties, and no new surface disturbance is required for the Unwabu expansion.

Several properties within the mining right are subject to registered servitudes, particularly those relating to access roads, electrical reticulation, pipelines, and conveyor corridors. These servitudes are long-standing and form essential components of the operational footprint. The underground workings also lie beneath a network of Eskom transmission lines and regional transportation routes, including sections of the N12 and R545, all of which have established legal rights of way and no anticipated conflict with subsurface mining activities.

The land within the mining right area supports a mosaic of land uses, including active mining, grazing, limited crop production, and disturbed land awaiting rehabilitation. The proximity of the mine to the settlements of Phola and Ogies highlights the importance of clear property demarcation, stakeholder engagement, and compliance with land access conditions.

From a water management perspective, the cadastral layout is significant because several properties contain or overlie sensitive wetland and drainage features, such as hillslope seepage wetlands and channelled valley-bottom wetlands. Although the Unwabu project requires no new surface infrastructure, the underground workings extend beneath or adjacent to these systems, which is relevant to Section 21(c) and 21(i) water uses. The property configuration also determines the placement of monitoring boreholes, stormwater diversion measures, and access points for environmental inspections.

In summary, the property framework of the KPS operation is well established, fully authorised, and supportive of the Unwabu underground expansion. The use of existing infrastructure and legal access rights ensures that the project remains confined within its approved operational footprint while maintaining full compliance with relevant land-use and water-use legislation. Table 1-4 provides property details for the proposed infrastructure's location.

The following properties are directly associated with the newly triggered water uses for Project Unwabu:

**Table 1-4: Property details**

Water Use	Farm Name	Farm Portion	SG Code
21(j)	Twefontein 328 JS	Portion 5/328	T0JS0000000032800005
21(c) & 21(i) – Start Point	Twefontein 328 JS	Portion 8/328	T0JS0000000032800008
21(c) & 21(i) – End Point	Hartebeestlaagte 325 JS	Portion 40/325	T0JS0000000032500040

### 1.5.2 Land Tenure

The Klipspruit KPS Mining Right area spans several cadastral properties situated within the Twefontein and Hartebeestlaagte farming regions of Mpumalanga. All mining and associated water uses for the Unwabu underground expansion take place within the legally authorised mining right boundary and on properties for which the mining company holds formal land access and mineral rights. No additional land acquisition or expansion of the surface footprint is required to accommodate the proposed Section 21 water uses.

The land tenure arrangement is relevant to the IWWMP because the location of each water use must be linked to a specific farm name, farm portion and Surveyor-General (SG) cadastral code. This ensures accurate legal referencing, supports regulatory compliance, and confirms that all proposed water uses occur within areas where the proponent has lawful access and operational rights.

These cadastral references correspond to the georeferenced water use coordinates illustrated on the water uses map and are directly linked to the BD and H underground mining footprint. The Section 21(j) water use, relating to the dewatering of underground workings, occurs beneath Twefontein 328 JS, an authorised property within the Klipspruit Mining Right area. The Section 21(c) and 21(i) water uses occur where underground workings encroach near or beneath hillslope seepage and channelled valley-bottom wetland systems located across Twefontein 328 JS and extending towards Hartebeestlaagte 325 JS.

All identified farm portions fall within the established mining right boundary and are therefore legally accessible for both mining and associated water management activities. These farms are currently characterised by a mix of agricultural land uses and mining-influenced landscapes, typical of the Mpumalanga coalfield. Existing mining servitudes, such as those pertaining to access, powerlines, conveyors, and pipelines, are already registered across several of these properties, providing further legal and operational support for the ongoing activities.

From a regulatory perspective, linking each water use to its respective cadastral unit ensures transparency and traceability in the Water Use Licence amendment process. It also enables the DWS to verify that the proposed water uses occur within lawful boundaries and are consistent with the mine's permitted operational footprint. This level of clarity is essential for ensuring that environmental impacts are accurately assessed and managed within the appropriate property context.

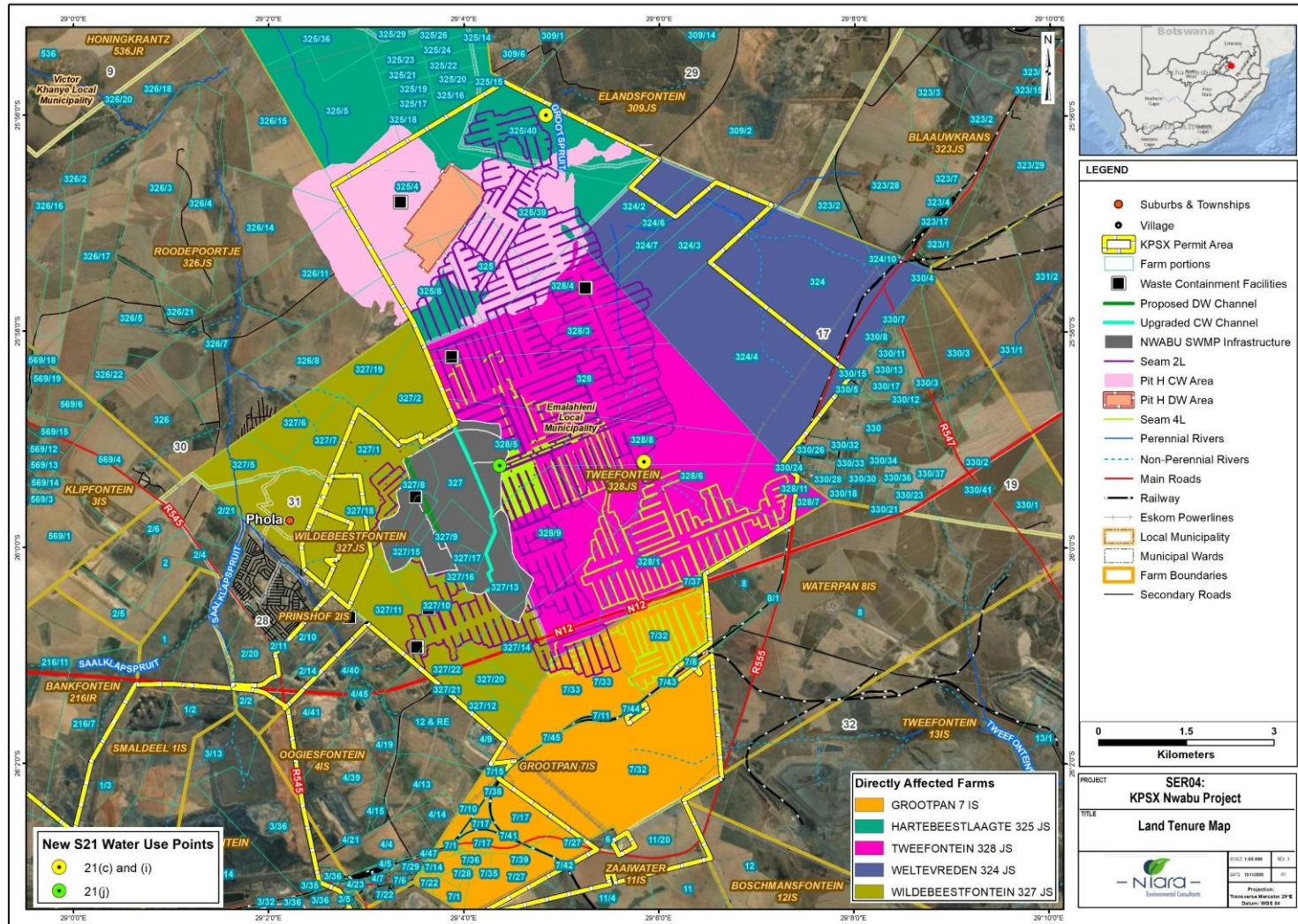


Figure 1-3: Land tenure Map

### 1.5.3 Sensitive Landscapes

The Mpumalanga Biodiversity Sector Plan indicated that the project area falls within a heavily or moderately modified area and Other Natural areas (refer to figure below).

The vegetation type is determined by a sensitive landscape and its varied topography is recognised as one of the catalysts to the high biodiversity in southern Africa. The rocky outcrops vegetation type was limited to the hillslopes of the Saalklapspruit River and Grootspuit River just above various wetland features that are evident throughout the river and riparian habitats (Digby Wells, 2020). The development of Pit H is not anticipated disturbed any areas of the rocky outcrops' vegetation.

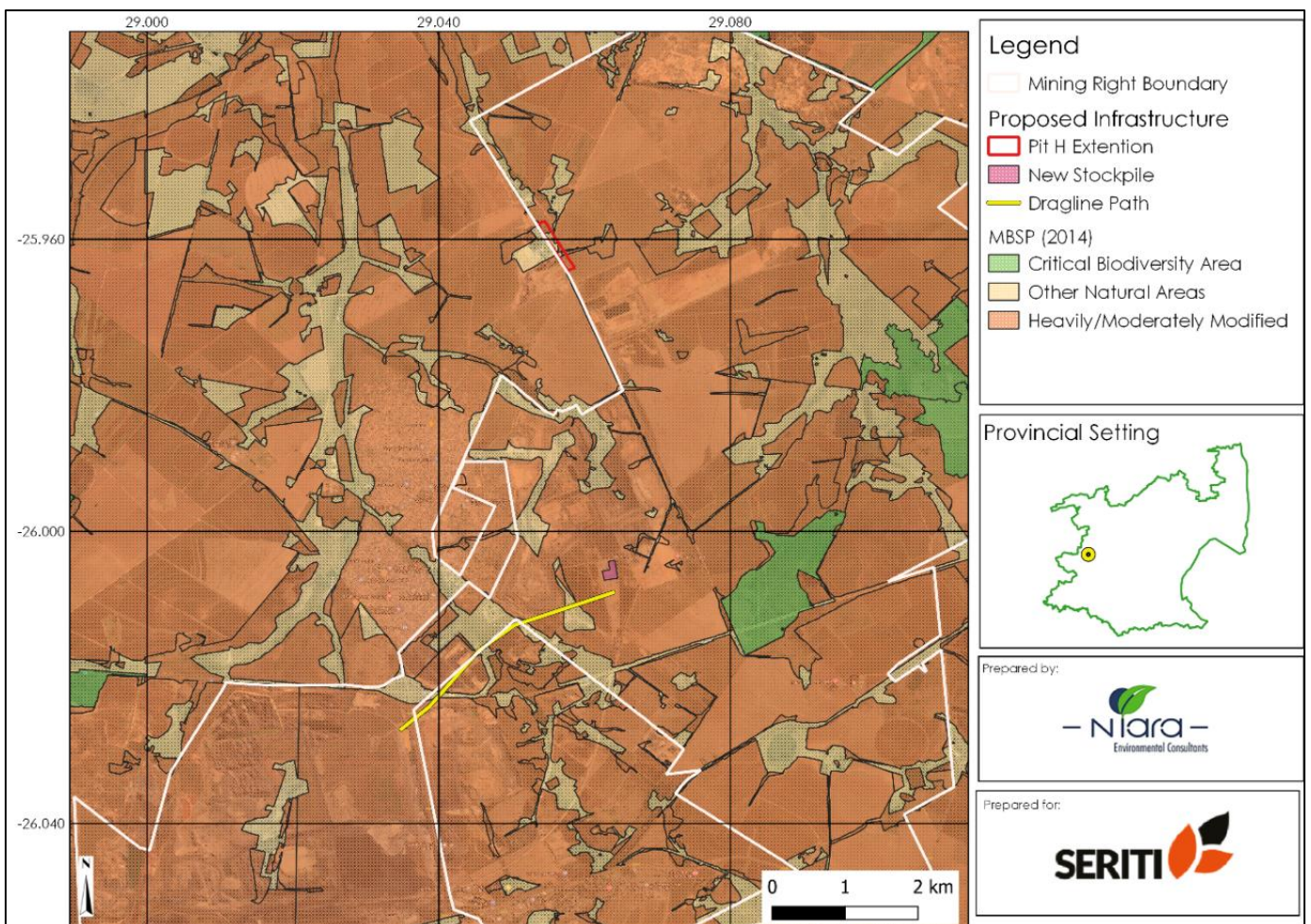
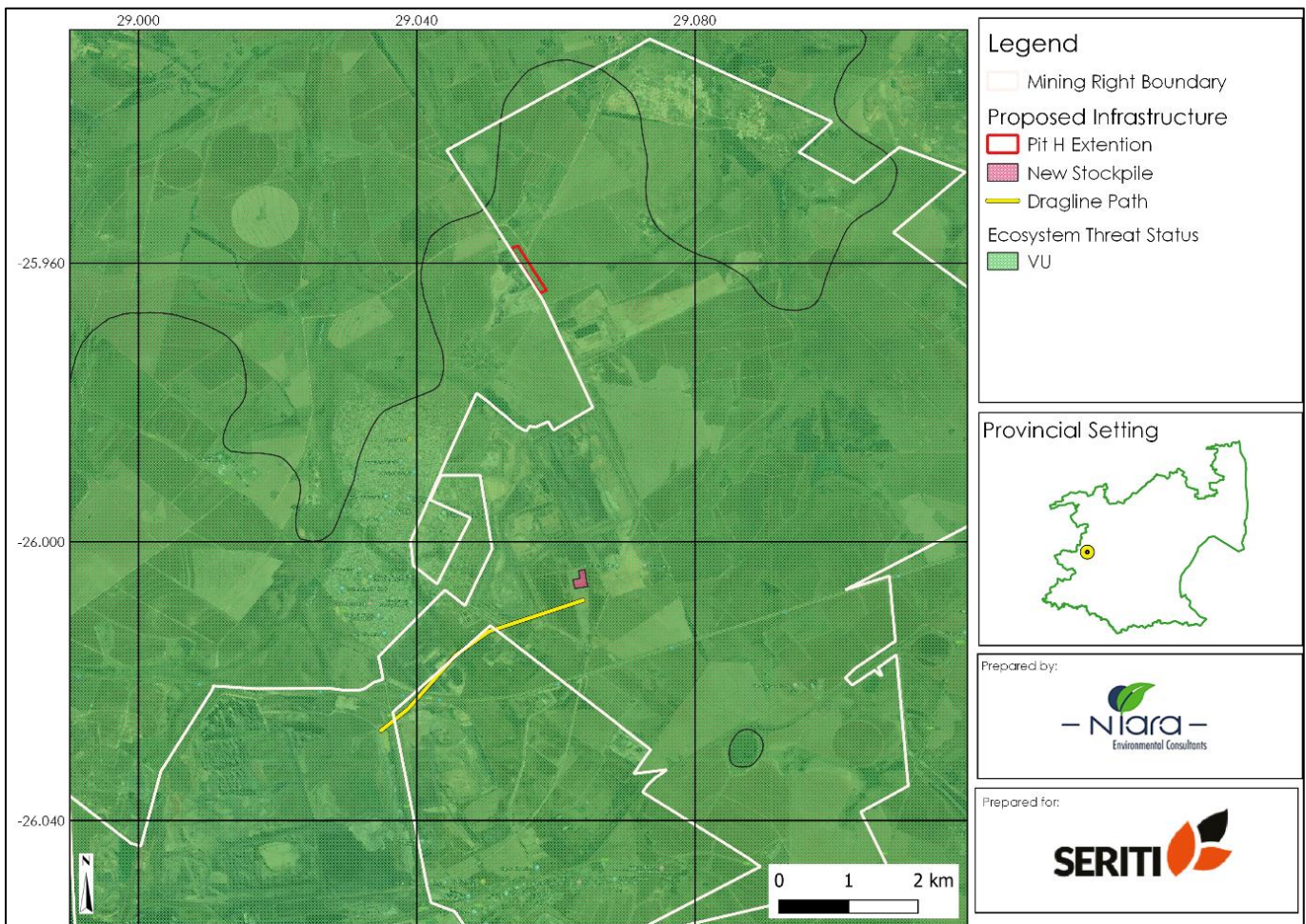


Figure 1-4: The Mpumalanga Biodiversity Sector Plan areas within the project area

### 1.5.4 Ecosystem Threat Status

The ecosystem within the proposed development areas was considered to be vulnerable. The ecosystem is at risk of transformation by various sectors including agriculture and mining. The ecosystem threat can be seen in the figure below.



**Figure 1-5: Ecosystem Threat Status of the ecosystems within the project area**

### 1.5.5 Environmental and Current Land Use Map

Refer to the environmental and current land use map below.

### 1.5.6 Surrounding Economic Activities

The project area benefits from a diversified economic base, with various sectors contributing to its prosperity and development. The synergy between coal mining, agriculture, transportation, and services sectors sustains economic activity and fosters growth in the town and its surrounding areas. Some of the primary economic activities in surrounding the project area include:

- 🌿 **Coal Mining:** Project site and its surrounding areas are well-known for coal mining activities. The town serves as a hub for coal extraction and processing, with several mines operating in the region. Coal mining is a significant contributor to the local economy, providing employment opportunities and driving economic growth.
- 🌿 **Agriculture:** Agriculture plays a vital role in project site and surrounding areas' economy. The fertile lands surrounding the town support agricultural activities such as crop cultivation, livestock farming, and poultry production. Agriculture not only provides employment but also supplies food to the local community and beyond.

- 🌿 **Transportation and Logistics:** project sites' strategic location along major transportation routes, including the N12 highway, facilitates transportation and logistics activities. The town serves as a key transportation hub for goods and commodities moving between Johannesburg, eMalahleni, and other nearby cities and towns.
- 🌿 **Services Sector:** The services sector in the project site encompasses a range of businesses and establishments, including retail stores, restaurants, healthcare facilities, educational institutions, and financial services. These services cater to the needs of the local population and contribute to the town's economy.

## 1.6 Purpose of the IWWMP

The IWWMP serves a central and strategic function within the KPS operations, fulfilling both statutory obligations and broader environmental management objectives. At its core, the IWWMP acts as a key compliance mechanism, providing the technical basis required to support the mine's existing WUL and to inform any amendments submitted through a WULA. By presenting a consolidated record of all authorised and newly triggered water uses, the plan ensures alignment with the requirements of the NWA and the procedural stipulations contained in GN R267 (Government Gazette 40713 of 24 March 2017).

Beyond legal compliance, the IWWMP reflects the mine's commitment to responsible and sustainable water stewardship. It aligns with the Best Practice Guidelines (BPGs) for Water Resource Protection in the South African Mining Industry (DWA, 2006–2008) and with KPS site-specific technical standards, thereby ensuring that operational practices are benchmarked against recognised industry norms. This integrated approach facilitates the optimisation of mine water management, minimises adverse impacts on surface and groundwater systems, and supports the protection of downstream users and ecological receptors.

Importantly, the IWWMP functions as a dynamic, adaptive management tool rather than a static report. As mining progresses, the plan will be reviewed and updated periodically, typically on an annual basis or in response to significant operational changes. This iterative process ensures that water and waste management strategies remain current, technically sound, and responsive to emerging risks, regulatory updates, evolving hydrological conditions, and advances in monitoring or treatment technology. In doing so, the IWWMP strengthens the mine's long-term capacity to proactively identify, mitigate and manage water-related risks to both environmental and human health.

The structure and content of the IWWMP are further guided by the Operational Guideline: Integrated Water and Waste Management Plan (DWA, 2010), ensuring that all relevant components, ranging from baseline assessments to impact analyses, mitigation measures and monitoring programmes, are addressed in a coherent and comprehensive manner. All technical information presented in the plan is derived from current and credible specialist studies, which are included as appendices and referenced in the accompanying R267 checklist. This approach ensures transparency, data integrity and consistency across the various specialist disciplines contributing to water resource management at KPS.

In summary, the IWWMP provides a legally compliant, technically robust and strategically integrated framework that supports effective water and waste management at Klipspruit. It functions not only as a regulatory requirement but also as a living tool for continuous improvement, enabling the operation to maintain high standards of environmental protection throughout the life of mine.

## 1.7 Scope of the IWWMP

The scope of this IWWMP encompasses all water- and waste-related activities associated with the KPS operations, with particular emphasis on the proposed underground expansion at Pits BD and H under Project Unwabu. The plan covers the full spectrum of water management functions, including abstraction, storage, conveyance, dewatering, wastewater handling, stormwater control, treatment, reuse and discharge where applicable. It also incorporates solid and hazardous waste management practices insofar as they intersect with water quality and water resource protection.

This IWWMP integrates baseline hydrological and hydrogeological information, identifies existing and newly triggered water uses in terms of Section 21 of the NWA, and provides technical motivation to support revised authorisations where required. The scope further includes an assessment of the capacity, condition and performance of existing water management infrastructure, including pollution control dams, containment facilities, stormwater systems, underground sumps and monitoring networks.

In addition to describing the mine's operational water and waste management systems, the IWWMP evaluates potential impacts on surface watercourses, wetlands, groundwater systems, downstream users, and sensitive environmental receptors. It outlines mitigation measures, monitoring programmes, emergency response mechanisms and reporting obligations necessary to ensure the protection of water resources throughout the life of mine.

The IWWMP also extends beyond the immediate project footprint by addressing cumulative impacts associated with regional mining and industrial activities, recognising that the mine operates within a broader, water-stressed catchment. Through this inclusive and integrated approach, the plan seeks to ensure that all water management practices at KPS remain compliant, sustainable and resilient in the context of evolving operational, environmental and regulatory conditions.

## 1.8 Alignment with the WUL

This IWWMP has been developed to align closely with the conditions, objectives and monitoring requirements stipulated in the existing Klipspruit WULs. It consolidates all authorised water uses under the current licence, identifies any gaps arising from operational changes, and provides the necessary technical motivation for the inclusion of new water uses triggered by the Project Unwabu underground expansion, specifically Section 21(j) dewatering and Section 21(c)/(i) subsurface watercourse alteration.

The plan serves as the primary supporting document for the WUL amendment process, ensuring that all statutory requirements set out in the NWA and GN R267 are met. Furthermore, the IWWMP mirrors the structure and content expectations of the WUL, addressing each condition through clearly defined management measures, monitoring actions, compliance indicators and reporting mechanisms.

Where relevant, the IWWMP provides updated information on water balances, infrastructure capacities, wetland and riverine sensitivities, groundwater behaviour, and risk assessments, ensuring the WUL remains current and reflective of the mine's operational reality. The plan also strengthens the link between the WUL and the mine's EMPr, supporting integrated regulatory compliance across water, environmental and mining legislation. Importantly, this alignment ensures that the mine's water

management strategies remain coherent, enforceable and auditable. By explicitly referencing WUL conditions and integrating them into operational procedures, the IWWMP enhances accountability, facilitates regulatory oversight, and ensures that the mine continues to meet its legal obligations while minimising water-related risks to the environment and local communities.

## 1.9 Section 21 Water Uses under Application

1. Section 21(j): Removal, discharge, or disposal of underground water that is necessary for the continuation of an activity or for the safety of people: Dewatering of ingress water from Pit BD to Pollution Control Dam 4 (PCD4) through existing pumping infrastructure.

Water is abstracted and monitored at flow meter numbers:

🌿 CL241-FQI001 (GP111A)

🌿 CL241-FQI003 (GP111B)

Volumes:

🌿 3 551 m<sup>3</sup>/day

🌿 1 296 115 m<sup>3</sup>/annum

Coordinates:

🌿 Latitude: 25°59'14.56"S

🌿 Longitude: 29°4'22.20"E\*\*

2. Section 21(c) and 21(i): Impeding or diverting the flow of water; and altering the bed, banks, course, or characteristics of a watercourse: Underground mining operations encroaching beneath and adjacent to:

🌿 Hillslope Seepage Wetlands, and

🌿 Channelled Valley-Bottom Wetlands,

🌿 associated with the underground extent of Seam 2, where the final underground mining boundary approaches the shallowest portion of these wetland systems.

Although no new surface disturbance is proposed, the underground footprint intersects the hydrological influence zone of these wetlands, constituting a subsurface alteration of a watercourse in terms of sections 21(c) and (i).

**Table 1-5: Coordinates**

Point	Latitude	Longitude
Start	25°59'12.40"S	29°5'50.95"E
End	25°55'59.82"S	29°4'50.54"E

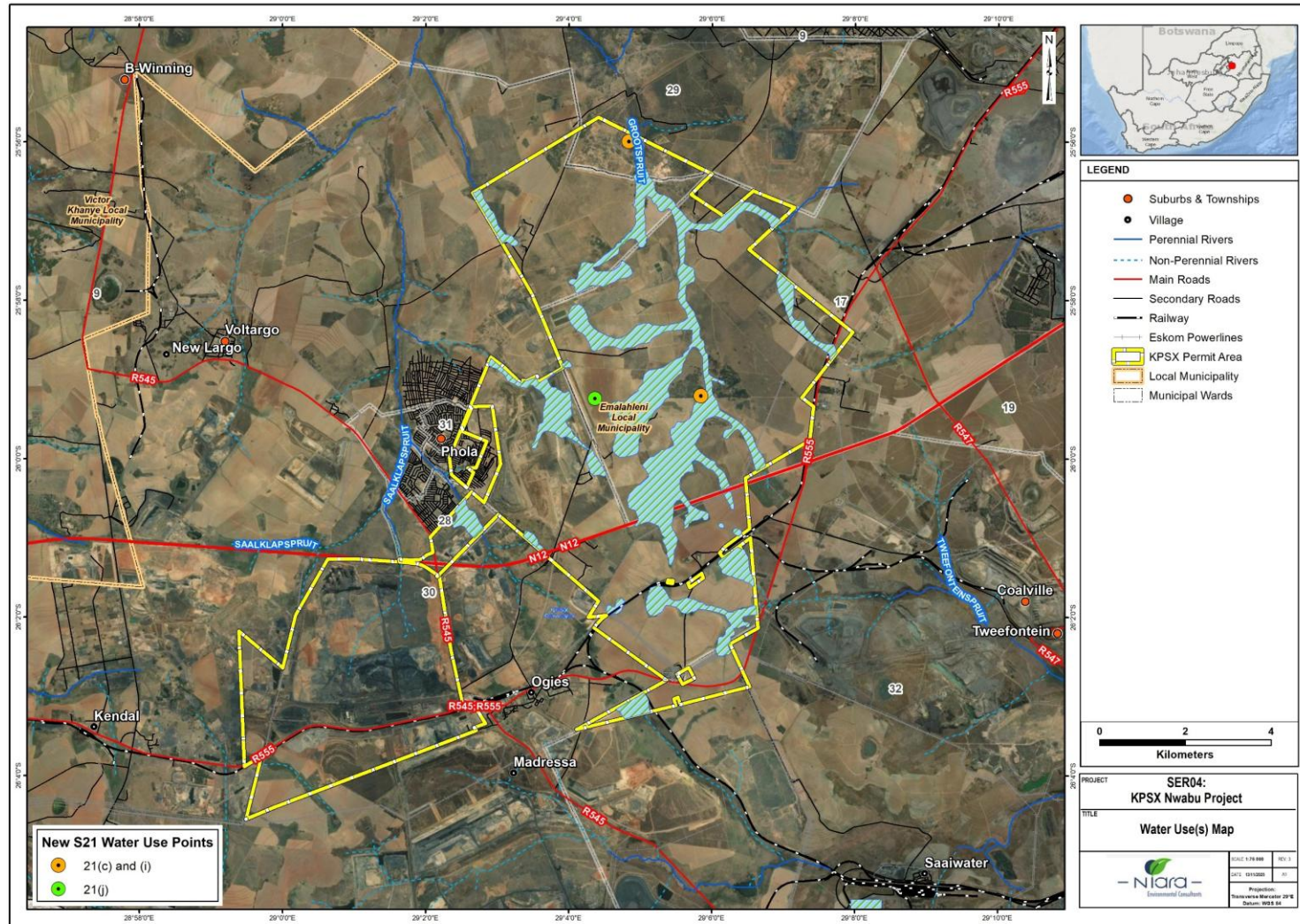


Figure 1-6: Section 21 Water Uses Map

Refer to the figure above. The map illustrates the spatial distribution of the newly triggered Section 21 water uses for the KPSX Unwabu Project and places them within the broader hydrological and socio-environmental context of the Klipspruit permit area. The map overlays the existing mining rights boundary, sensitive wetland systems, major transport corridors and key community nodes, providing a clear understanding of where the project's water-related interactions occur.

Two new water uses are depicted on the map. The first relates to Section 21(j), which is triggered by the dewatering of underground workings at Pit BD. The dewatering point is plotted in the northern portion of the project area, showing its close relationship to the existing mine water management network and its routing toward PCD4. This point confirms that the Section 21(j) water use is spatially confined to the underground expansions associated with Seam 2 and does not create any new surface disturbance.

The second set of points reflects the triggering of Sections 21(c) and 21(i). These water uses arise from the underground encroachment of mining activities beneath, or immediately adjacent to, several sensitive wetland systems, including hillslope seepage wetlands and channelled valley-bottom wetlands. Although the project introduces no new surface infrastructure, the underground workings extend into the hydrological influence zones of these wetlands. This subsurface interaction qualifies as altering the characteristics of a watercourse, and therefore constitutes a regulated water use. The mapped locations highlight the areas where the underground boundaries intersect with hydrologically sensitive features and demonstrate why these water uses must be included in the WUL amendment.

The map also shows several layers of regional infrastructure, including the N12 highway, the R545, R555 and R529 routes, as well as Eskom powerlines and railway corridors. These features emphasise that the project occurs within a well-developed mining and industrial landscape. The proximity of settlements such as Phola, Ogies, Coalville and Madrassa further underlines the importance of robust water management, given the social and environmental sensitivities in the region.

Wetland areas are clearly demarcated as hatched blue polygons, and the KPSX permit area is outlined in yellow, enabling easy interpretation of the extent to which the proposed underground mining interfaces with natural drainage and wetland functions. The map provides a defensible spatial basis for understanding the new water uses triggered by the project and supports the justification included in the IWWMP and WUL amendment.

## 2 Contextualisation of Activity

### 2.1 Description of Activity

#### 2.1.1 Mining

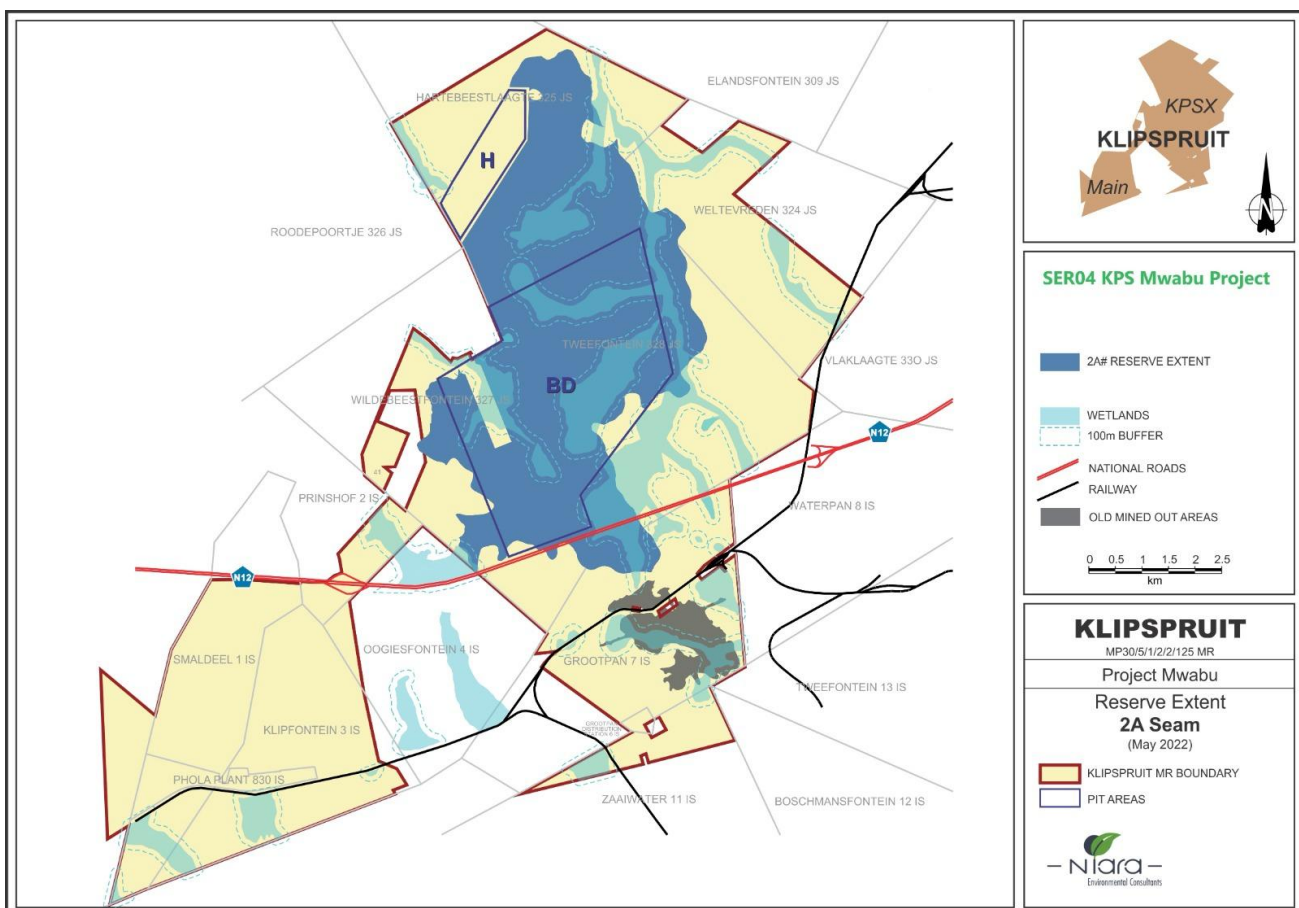
KPSX was approved in 2011 with the mining of the full extent of Pit BD via the OC method. Pit H was further approved in 2023 for mining via OC method. When Seriti Power took over the operation of KPS in 2021 from South32 SA Coal Holdings, Seriti Power undertook an evaluation of all the assets obtained. The evaluation's focus was on the viability of the mine, including product market evaluations, operational optimisation and cost optimisation. This resulted in Seriti Power's change in mining strategy for the whole of

KPS's remaining reserves from OC to UG. UG mining was the initial strategy for KPSS mining in 2006 but was later changed to OC in 2017 due to the economic value at the time.

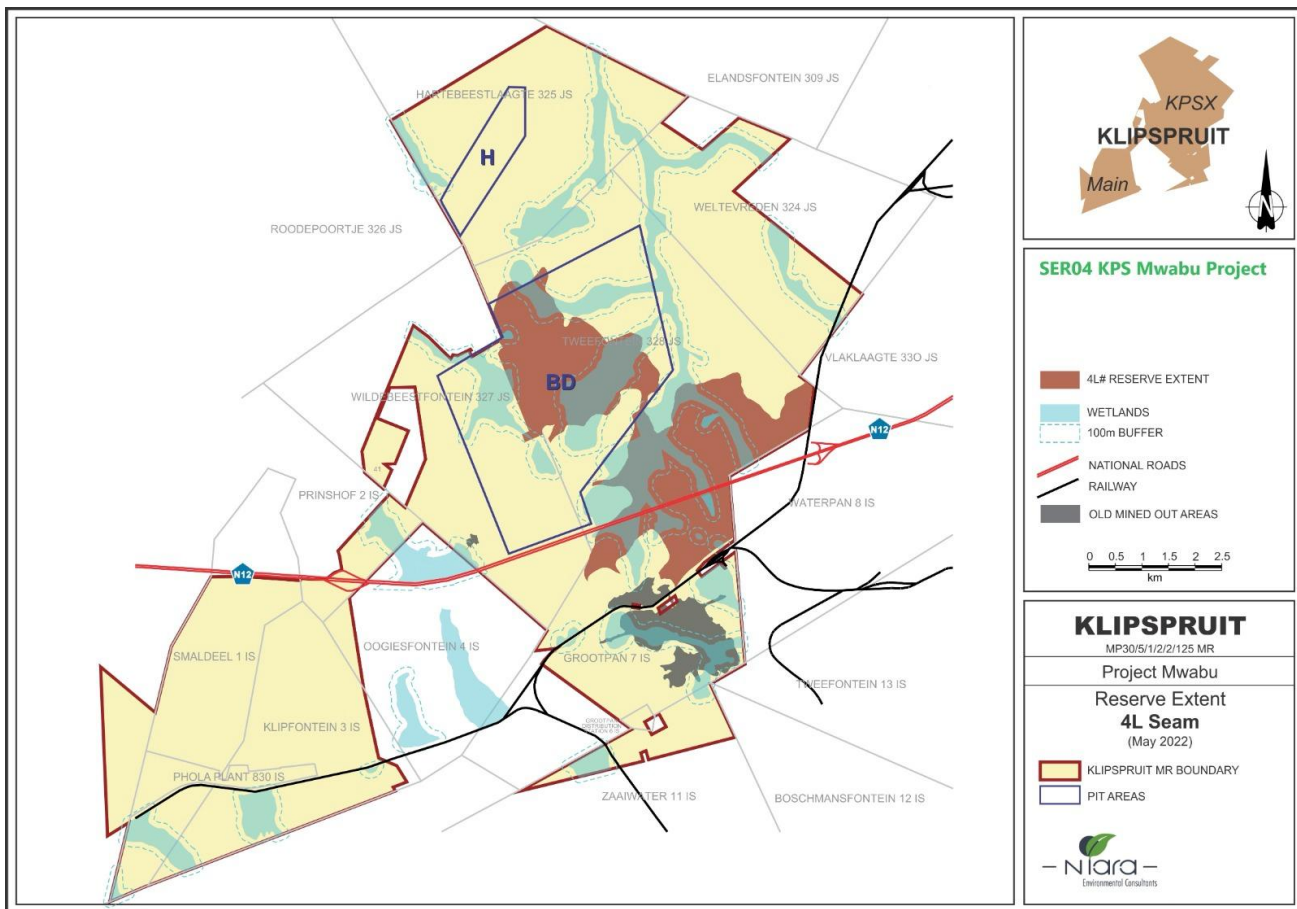
**2.1.1.1 KPSX Proposed Mining**

The KPSX mining of Pit BD was amended from OC to UG in October 2022 through a S102 amendment process as contemplated under the MPRDA. The EA amendment is still outstanding. The S102 approved amendment covers the full extent of the unmined UG reserves within the KPSX (including Pit H) and KPSS mining areas as indicated in **Figure 1-2** above. The mineable coal seams within the KPSX area are the following and the focus of the UG mining will be on the main seams as illustrated in **Figure 2-1** and **Figure 2-2**:

- 🌿 5 seam ("S5")
- 🌿 4 upper A seam ("S4A")
- 🌿 4 upper seam ("S4U")
- 🌿 4 lower seam ("S4L")
- 🌿 2A seam ("S2A")
- 🌿 2 seam ("S2")
- 🌿 1 seam ("S1")



**Figure 2-1: Proposed S2A mining**



**Figure 2-2: Proposed S4L Mining**

The mineable coal seams at KPSS will include S5, S4U, S2 and S1.

UG mining has commenced within the Pit BD boundary and the mining method being utilised is bord and pillar mining. The inclusion of the bord and pillar mining method was to ensure optimal extraction of areas that are not profitable by OC method due to high strip ratio (Seriti Power, 2022). An adit has been developed from the pit BD highwall which provides access to the UG workings. The mining will advance towards the North, East, West and Southern directions from the Pit BD boxcut area. The proposed UG mining for both KPSS and KPSX is depicted in Figure 2-3 below. The proposed UG mining will extend mining to 2042. The UG workings designs are based on the following principles for both KPSS and KPSX (Seriti Power, 2022):

- UG workings are expected to be located approximately 25m below the ground surface with a mining height cut-off at 1.5m.
- A safety factor of not less than 1.3 will be applied on all workings with a pillar survival estimated at >99% for >500 years.
- No superimposition of the pillar between S4L and S2A and superimposition of the pillar between S2A and S1 as recommended by the geotechnical study.

UG mining using bord and pillar method will be conducted using a Continuous Miner ("CM") with parallel roadways in the direction of the advance. Perpendicular roads called splits will be developed at predetermined intervals to parallel roads. These road interlinks are the ones that create the pillars. The following activities form part of the board and pillar mining method (Seriti Power, 2022):

- 🌿 Coal cutting and loading: The CM uses the rotating drum to cutting head, equipped with cutting picks to cut the coal face. The loading mechanism collects the broken coal and delivers it onto the gathering arm, which loads the coal on the CM's chain conveyor. The CM's conveyor transports the broken coal from the front to the rear of the CM. The CM's chain conveyor's capability of horizontal and vertical movements allows for coal loading into the shuttle car.
- 🌿 Coal hauling and tipping: The loaded shuttle car is used to haul the coal to the section feeder breaker that crushes the coal and feeds it into the conveyor belt system.
- 🌿 Roof support: A roof bolt machine installs the roof bolts once the CM has finished the development face and roof support is installed on a systematic basis. Roof bolts enhance the stability of the overlying roof. The spacing between roof bolts and the length of the roof bolts is determined during geotechnical studies.
- 🌿 Coal transportation: The coal is transported using a conveyor belt system from the mining sections to the coal stockpile, linked with the overland conveyor on surface via the UG adit.

The strategy for the mining of the KPSS UG reserve will follow the same methodology as the one depicted above for KPSX and the UG resource will be accessed by using an adit which will be developed on the KPSS OC highwall.

#### **2.1.1.2 Processing**

Once the coal is mined from the UG workings, it will be transported via a network of conveyors to the Phola Processing Plant ("PCPP") which is located adjacent to the KPS operation. The coal is beneficiated here resulting in various grades of quality produced. Following beneficiation at the PCPP, the coal will be transported via rail to the Richards Bay Coal Terminal for export, with a small component being retained for domestic use. Coal discard will be stored at the existing discard dump at the KPS and will be used as additional backfill material in the mining voids as part of the rehabilitation of the KPS.

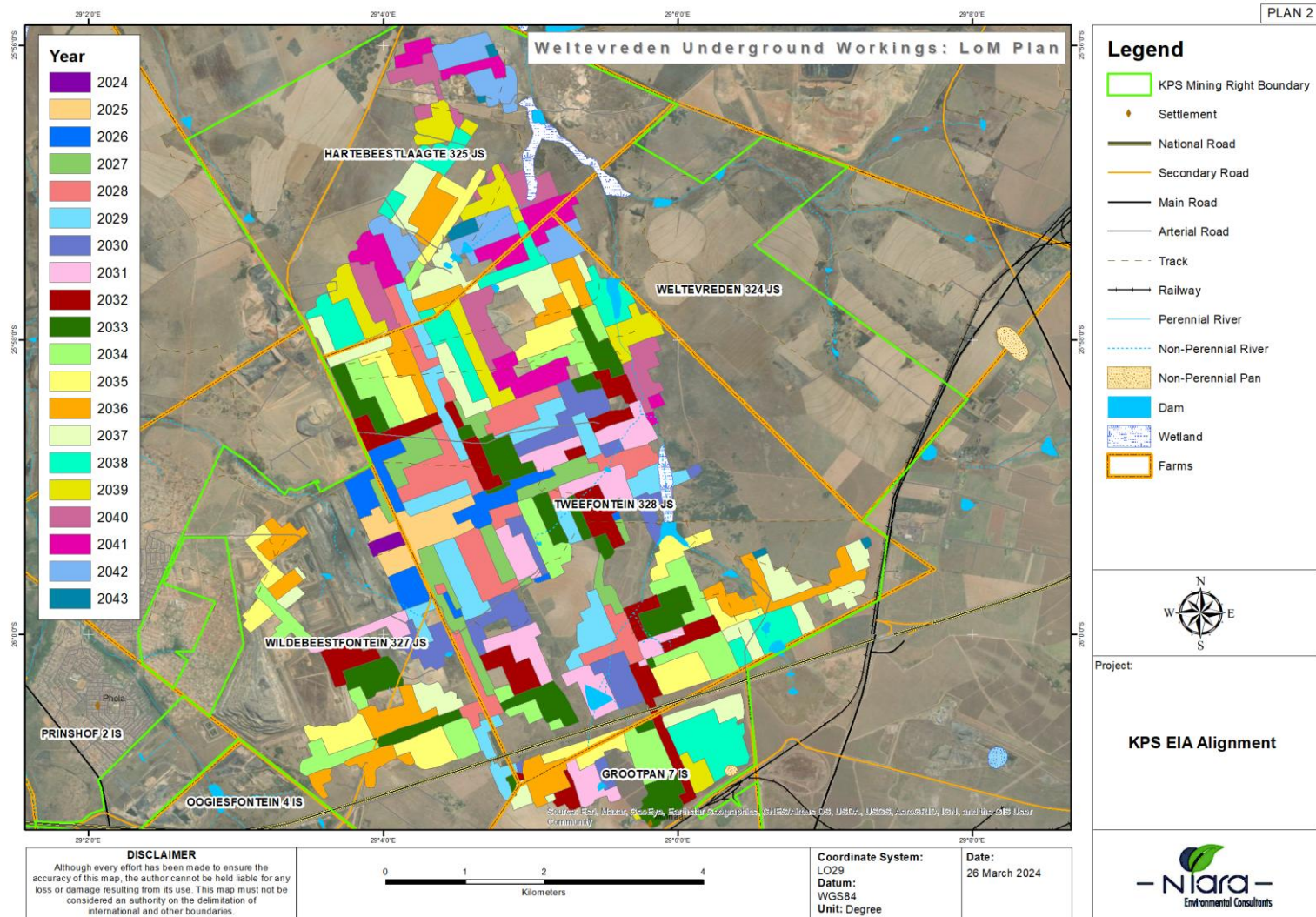


Figure 2-3: Life of Mine plan for the proposed KPSX UG mining

### 2.1.1.3 Waste Management

All waste generated on site will be managed accordingly as per KPSX's existing waste management procedures.

### 2.1.1.4 Summary of the Infrastructure Requirements

An adit has already been developed to support the UG mining at KPSX together with the supporting UG conveyors. An adit with the supporting UG conveyors will be constructed to support the UG mining at KPSS. This will be constructed on the existing KPSS OC highwall. Further, additional ventilation shafts and rescue boreholes will be constructed in strategic areas as the mining advances for both KPSX and KPSS. To manage additional dewatering activities from the UG workings, pipelines will be constructed which will link up with existing pipelines on surface and discharge in existing pollution control dams ("PCDs"). Should there be a need in future, a storage dam might also be constructed underground. Potable water supply to the UG workings will be delivered by pipelines which will link up with the existing potable water supply from the Emalahleni Water Treatment Plant. All other existing infrastructure will be utilised to support the proposed UG mining development including PCDs, power supply, haul roads, workshops, pipelines and water supply. The layout for the infrastructure at KPSX is depicted in **Figure 2-4**.



**Figure 2-4: Layout for KPSX UG haul roads, pipelines, conveyor, load-haul and feed infrastructure**

## 2.2 Extent of Activity

The estimated total area of disturbance associated with the three pits and associated infrastructure is approximately 535 hectares.

## 2.3 Key Activity Related Processes and Products

This section details how Seriti Power intends to mine coal from KPSX and KPS and what processes will follow with regards to the final product.

### 2.3.1 Processes and Products

The RoM coal will be temporarily stored at the RoM stockpile and tip area, located in the western sections of the KPSX project area. The RoM coal will initially be hauled by trucks from the stockpile to the KPS for beneficiation and further processing at the Phola Coal Processing Plant (PCPP). Once the operations have been ramped up to full production, RoM coal will be transported by conveyor.

Coal discard will be stored at the proposed discard dump at the KPS and will be used as additional backfill material in the mining voids as part of the rehabilitation of the KPS.

After processing, the product produced will be transported via rail to the Richards Bay Coal Terminal (RBCT) where it will be exported. A small component of the product will be for domestic use.

## 2.4 Activity Life Description

The expected life of KPS mine for the project according to the latest life of mine (LoM) plan provided is 29 years.

## 2.5 Activity Infrastructure Description

Once coal is extracted from the underground workings, it is transferred via the existing conveyor network to the Phola Coal Processing Plant (PCPP), situated adjacent to the Klipspruit operation. At the PCPP, the coal undergoes beneficiation to produce a range of quality grades suitable for different market requirements. Following processing, the product coal is transported primarily via rail to the Richards Bay Coal Terminal (RBCT) for export. A smaller portion of the coal is retained for domestic supply in line with market demand.

Coal discard generated during beneficiation is deposited at the existing discard facility within the KPS operations. This discard material will subsequently be utilised as additional backfill within mined-out underground voids and open-cast areas, forming part of the broader rehabilitation and landform stabilisation strategy for Klipspruit.

The underground expansion at Klipspruit (Pits BD and H) will employ a bord-and-pillar mining method, which is the standard approach at the KPS underground operations. This method entails the systematic extraction of coal panels while leaving behind a network of coal pillars to maintain geotechnical stability and support the overlying strata. Development will proceed along clearly defined mains and sub-mains, from which production sections will branch off into designated mining blocks.

Mining advances will be guided by a detailed mine layout plan that incorporates geological structure, seam thickness, quality parameters and hydrogeological considerations. Ventilation, conveyor movement, support installation and water management in working sections will follow established KPS protocols. The mining method has been selected to ensure operational efficiency while minimising potential subsurface impacts to overlying wetlands and groundwater systems.

### 2.5.1 Underground Layout

The underground workings for Pits BD and H form part of the broader KPS underground network, connecting into existing infrastructure where feasible. Access to these new mining areas will utilise previously established entries and declines, ensuring that no new surface disturbances are introduced. The layout consists of:

- main gate roads and sub-mains forming the primary access routes;
- panel developments aligned with structural and geological constraints;
- strategically located ventilation circuits to ensure airflow and worker safety; and
- underground sumps and pumping stations designed to manage ingress water from the BD/H sections.

The underground layout also reflects the proximity of certain mining areas to sensitive hillslope seepage and valley-bottom wetlands. These relationships have been considered in the final design to minimise hydrogeological drawdown and reduce the risk of subsurface interaction with the watercourses.

### 2.5.2 Infrastructure Description

The BD and H underground expansions will rely entirely on existing, authorised surface and underground infrastructure, ensuring that no additional construction or footprint increase occurs. Key infrastructure components include:

- ☛ Conveyor systems linking underground workings to the surface and onward to the Phola Coal Processing Plant;
- ☛ Pumping systems and sumps located underground for the removal of ingress water in accordance with Section 21(j) requirements;
- ☛ Ventilation shafts and fans forming part of the integrated KPS ventilation network;
- ☛ Electrical and communication systems extending from established surface substations to support mining equipment and safety systems;
- ☛ Pollution Control Dam 4 (PCD4) and associated dirty-water management infrastructure that receive pumped underground water; and
- ☛ Waste and materials handling areas, including existing workshops, stores, change houses and laydown areas within the approved mining footprint.

All infrastructure complies with the KPS engineering standards and the requirements of GN 704, ensuring that water management, containment and environmental protection standards are upheld throughout the operation.

### 2.5.3 Processing and Product Handling

All coal extracted from the BD and H underground workings is integrated into the existing Klipspruit product handling chain. Once conveyed to surface, the coal is transferred via the established overland conveyor system to the PCPP. The PCPP undertakes full beneficiation through crushing, screening, dense medium separation, and product upgrading, resulting in multiple coal quality fractions for both export and domestic markets.

Processed coal destined for export is loaded onto trains at the Phola rail load-out facility and transported to the RBCT. Domestic product is routed to Eskom or other local industrial consumers as dictated by contractual arrangements. This integrated system ensures a seamless flow from underground production to final product dispatch, without the need for any new surface infrastructure for the Unwabu expansion.

### 2.5.4 Waste Management Infrastructure

Waste management at Klipspruit is coordinated through a network of existing, fully authorised waste handling facilities. The BD and H underground expansion will utilise this infrastructure without modification. Key components include:

- 🌿 **Coal Discard Dump:** Beneficiation waste from the PCPP is delivered to the existing discard facility located within the KPS footprint. This discard material is compacted and shaped according to approved designs, and a portion will be repurposed as backfill material in mined-out underground voids and open-cast pits as part of long-term rehabilitation.
- 🌿 **Hazardous Waste Facilities:** Hydrocarbon-contaminated waste, used oils, grease, and chemical containers are managed at the dedicated hazardous waste handling area and removed offsite through licensed service providers in compliance with the National Environmental Management: Waste Act (Act 59 of 2008).
- 🌿 **Sewage and Greywater Infrastructure:** Worker sanitation needs are met through existing ablution blocks, septic tanks, conservancy tanks and wastewater treatment systems on site.
- 🌿 **Materials Handling and Laydown Areas:** Existing workshops, stockpile areas, stores and fuel depots service the underground fleet and continue to operate within approved containment and spill-prevention systems.

This centralised system ensures effective containment, monitoring and disposal of all waste streams generated through the Unwabu operations.

### 2.5.5 Stormwater Management System

Stormwater management across the Klipspruit operation is designed to ensure strict separation between clean and dirty water systems, in accordance with GN 704 and mine-specific engineering standards. No new stormwater infrastructure is required for the BD/H underground expansion; all activities are managed within existing systems.

Clean runoff from undisturbed areas is diverted away from operational zones using berms, channels and perimeter drains to prevent contamination. Dirty water from coal handling areas, workshops, stockpiles and conveyor routes is captured in lined containment structures and directed to PCDs forming part of the mine's dirty-water reticulation system. Regular inspections ensure that freeboard, capacity and drainage infrastructure remain compliant with design criteria, including peak storm event requirements.

The underground workings themselves do not generate surface stormwater; however, the broader stormwater system indirectly supports operational resilience by preventing uncontrolled inflows that could affect underground stability or increase pumping demand.

## 2.5.6 Dewatering and Pumping Systems

The BD and H underground workings will generate ingress water requiring removal to maintain safe working conditions and support efficient mining operations. Dewatering is undertaken through a network of underground sumps, pump chambers and rising mains that connect to the existing dirty-water system on surface.

Water pumped from the underground workings is routed to Pollution Control Dam 4 (PCD4), which forms part of the central mine water management circuit. Flow is measured using calibrated flow meters to ensure accurate reporting and compliance with authorised Section 21(j) water use commitments. Pumping infrastructure includes:

- ✔ Primary and secondary pump stations located at strategic low points in the underground network;
- ✔ Automated pump controls linked to water-level sensors;
- ✔ Redundant pumping capacity to ensure operational continuity;
- ✔ Dedicated power supply via the established KPS electrical network; and
- ✔ Compliance with engineering standards for bunding, containment and pipeline maintenance.

The system is designed to safely manage expected inflows from BD/H without requiring any new surface facilities, ensuring full integration with the Klipspruit water balance and existing authorised infrastructure.

**Table 2-1: Summary of the Approved and Proposed Infrastructure Amendments/ Additions for the Project**

Approved Infrastructure Requirements	Proposed Amended Infrastructure Requirements
<ul style="list-style-type: none"> <li>✔ Open-pit BD including ramps and box cuts;</li> <li>✔ Internal haul roads; and haul roads for the transport of ROM coal to KPS;</li> <li>✔ Access roads for light vehicles;</li> <li>✔ Clean water cut off canals and storm water berms;</li> <li>✔ Raw water tanks;</li> <li>✔ ROM stockpile and tip area;</li> <li>✔ Overland conveyor;</li> </ul>	<ul style="list-style-type: none"> <li>✔ Change of mining method from OC to UG; and</li> <li>✔ Underground mining encroaching on Hillslopes Seepage and Channelled Valley bottom wetlands. Seam 2 final extent boundary edge (as the closest to surface) referenced.</li> </ul>

Approved Infrastructure Requirements	Proposed Amended Infrastructure Requirements
<ul style="list-style-type: none"> <li>✔ Overburden and topsoil stockpiles;</li> <li>✔ Substation;</li> <li>✔ PCDs and associated pipelines to the PCPP;</li> <li>✔ Diesel and oil storage tanks;</li> <li>✔ Fuel bay</li> <li>✔ Change house facilities;</li> <li>✔ Sewage treatment plant (STP);</li> <li>✔ Workshops and mobile offices;</li> <li>✔ High mast communication tower;</li> <li>✔ Electricity supply to workshops and shovel.</li> </ul>	

## 2.6 Key Water Uses and Waste Streams

This section provides additional information with regards to the water uses identified as well as the various waste streams to be generated as part of the proposed developments.

### 2.6.1 Water Supply

Water supply for the project for both the construction (i.e., process and service water use such as for dust suppression) and operational activities will be sourced from the Balancing Dam at KPS and from municipal supply. Potable water will be fed from the existing KPS operation which is sourced from the eMalahleni Water Reclamation Plant (EWRP).

### 2.6.2 Waste Stream Characterisation

Various waste streams will be generated during the development and operation of the project. These waste streams to a large extent will be incorporated into the existing KPS waste management practices. The potential waste streams identified include:

- ✔ General waste (incl. plastic, glass, organic waste and tin cans);
- ✔ Hazardous waste (incl. used oil and grease, empty chemical containers, flammable liquids, oil rags,
- ✔ batteries and florescent tubes/light bulbs); and
- ✔ Sewage effluent from the ablution facilities at the site.

Construction activities will result in an increase of waste being generated on site but will form part of the existing waste management plans for Seriti Power.

## 2.7 Organisational Structure of Activity/Company

The environmental management at KPS is the responsibility of the KPS management team and is undertaken according to the approved EMP's. The organisational structure at KPS is presented in Figure 2-5 below.

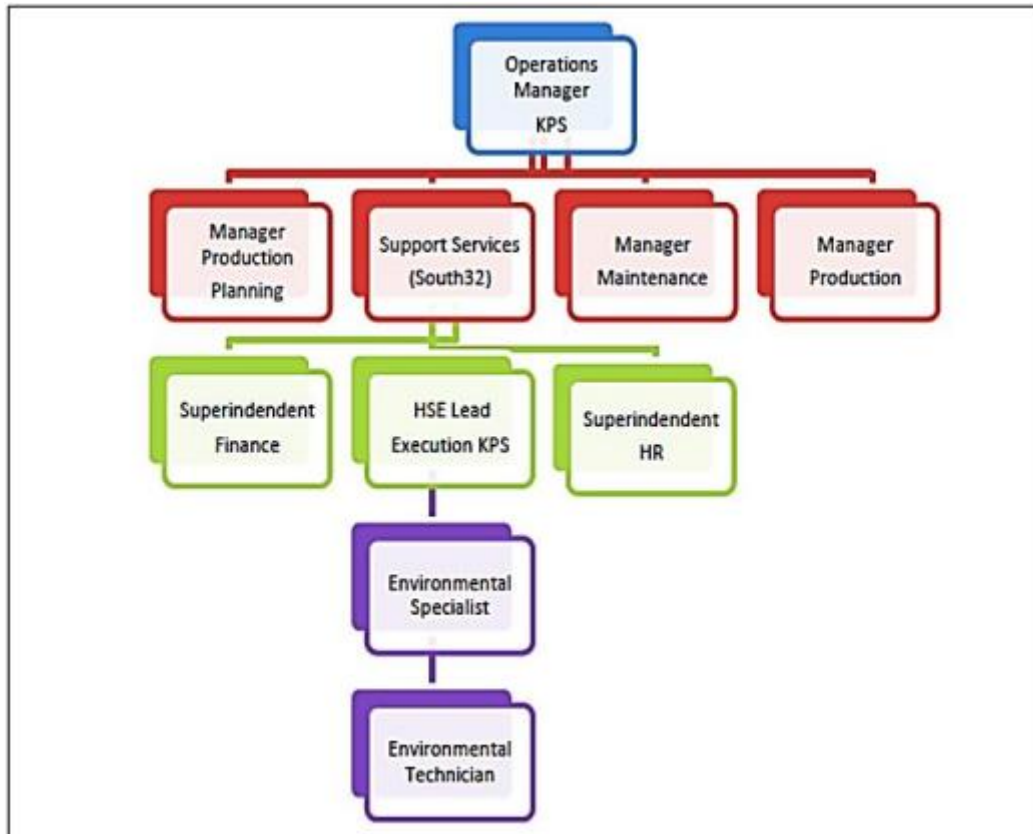


Figure 2-5: Organisational Structure for KPS (Digby Wells, 2019)

## 2.8 Business and Corporate Policies related to the Environment

Seriti Power is committed to providing a safe and healthy work environment, ensuring sound environmental management and supplying good quality services. This is achieved with continual improvement of business practices and prevention of pollution as well as complying with relevant legislation, regulations and other requirements, as well as ensuring an enlightened work-force. To provide such an environment, KPS will:

- 🌱 Conduct its operations with due regard to South African legislation, standards and other requirements relevant to the business in terms of safety, health and environment;
- 🌱 Train and hold employees and contractors accountable for performance within their areas of responsibility pertaining to safety, health and potential environmental impacts, ensuring high quality products and services;
- 🌱 Prevent pollution through the management of risk through appropriate systems and procedures;

- 🌿 Provide a structure and responsibility to facilitate effective safety, health and environmental management;
- 🌿 Communicate the safety, health and environment policy to employees, contractors and visitors to ensure their understanding of obligations in respect of this policy; and
- 🌿 Protect the environment (both the natural systems on site as well as the responsible consumption of natural resources), ensuring sustainable biodiversity.

### 3 Regulatory Water and Waste Management Framework

There are several legal and regulatory frameworks governing mine water management in South Africa. A summary of these is provided in Table 3-1, with specific details related to the National Water Act (NWA) and the National Environmental Management: Waste Act (NEM: WA), Act 59 of 2008, provided in the remainder of this section:

**Table 3-1: Water management legal and regulatory framework requirement**

Legislation / Regulation	Key Provisions	Applicability to the Unwabu BD & H Underground Expansion
<b>Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)</b>	Establishes the Bill of Rights, including Section 24 which guarantees the right to an environment not harmful to health or well-being and requires that the environment be protected through reasonable legislative and other measures.	The project must ensure that underground mining activities, dewatering, watercourse interactions and rehabilitation practices do not compromise environmental quality, public health or ecological integrity. All water management measures in the IWWMP support the fulfilment of Section 24 obligations.
<b>National Water Act (Act 36 of 1998)</b>	Provides for the protection, use, development and management of water resources. Section 19 sets out obligations to prevent, control and remedy pollution. Section 21 identifies water uses requiring authorisation.	The project triggers Section 21(j) for dewatering of underground workings and Section 21(c) and (i) for subsurface alteration of watercourses. The IWWMP provides the required motivation, monitoring, mitigation and reporting measures to ensure compliance. Section 19 obligations apply to pollution prevention, water containment and remediation.
<b>National Water Amendment Act (Act 27 of 2014)</b>	Aligns WULA processes with NEMA and MPRDA, integrating environmental and mining authorisations with water-use approvals.	The WUL amendment for Unwabu aligns with the EA and Mining Right already issued for the underground expansion. This act reinforces the need for integrated review between DMRE, DWS and DEFF systems.
<b>GN R704 – Regulations on Use of Water for Mining and Related Activities (1999)</b>	Regulates mine water management, requiring separation of clean and dirty water, containment of polluted water, and restricting activities within 100 m of a watercourse or within the 1:100-year floodline.	Underground BD/H activities occur beneath wetland influence zones and therefore intersect regulated areas subsurface. The project uses existing GN704-compliant infrastructure. An exemption is sought only where underground workings occur beneath watercourses. No new surface disturbance is proposed.

Legislation / Regulation	Key Provisions	Applicability to the Unwabu BD & H Underground Expansion
<b>GN R267 – Regulations on Procedural Requirements for WUL Applications (2017)</b>	Prescribes the structure, information requirements, and timeframes for WULAs. Decisions on WULAs must be made within 300 calendar days.	This IWWMP is structured in accordance with GN R267 and forms the supporting document for the WUL amendment for BD/H. All procedural requirements, including the checklist, specialist inputs and submission format, align with these regulations.
<b>GN 509 – General Authorisation for Section 21(c) and (i) Water Uses (2016)</b>	Defines regulated areas of watercourses, including 100 m buffers, 1:100-year floodlines and 500 m wetland regulated zones. Describes circumstances where general authorisation may apply.	The BD/H workings occur below wetland regulated areas and therefore require authorisation under Section 21(c) and (i). The underground-only interaction does not qualify for General Authorisation; hence it is included in the WUL amendment.
<b>Water Services Act (Act 108 of 1997)</b>	Regulates water services institutions and water quality standards for domestic and potable supply.	Potable water supply for mine workers and operational use must comply with standards under this Act. The project does not abstract potable water but must ensure no contamination of water resources used for community supply.
<b>National Environmental Management Act (Act 107 of 1998)</b>	Establishes duty of care obligations under Section 28 to prevent pollution and environmental degradation. Applies to all environmental media including water.	All activities under Unwabu must prevent pollution of surface or groundwater. Duty-of-care obligations apply to underground dewatering, spill response, stormwater control and groundwater monitoring. The IWWMP provides the required measures to satisfy Section 28 obligations.
<b>EIA Regulations (GN R982–985, 2014, as amended)</b>	Provides procedures for Environmental Authorisations, scoping, impact assessments and amendments.	The BD/H underground expansion has an existing EA under DMRE. The IWWMP ensures operational compliance with EA conditions related to water management, monitoring and reporting.
<b>National Environmental Management: Waste Act (Act 59 of 2008)</b>	Regulates waste avoidance, reduction, recycling, classification, storage, treatment and disposal. Requires assessment of waste for landfill disposal and management of hazardous waste.	No new waste facilities are proposed for Unwabu. Waste generated from underground operations, including hydrocarbons and contaminated materials, must be managed and disposed of in accordance with NEM:WA. Waste classification and recordkeeping obligations apply.
<b>Waste Classification and Management Regulations (GN R634, 2013)</b>	Requires classification of all waste streams according to SANS 10234 and assessment of waste destined for landfill disposal.	Workshop waste, hydrocarbon residues, and other hazardous underground waste must be classified, stored and disposed of in accordance with these regulations.
<b>Regulations on Planning and Management of Residue Stockpiles and Deposits (GN R632, 2015)</b>	Sets requirements for characterisation, risk assessment, monitoring, design and closure of residue stockpiles and deposits.	No new residue stockpiles or deposits are created by the BD/H underground expansion. Existing facilities remain managed under the KPS EMPr and WUL. The project must

Legislation / Regulation	Key Provisions	Applicability to the Unwabu BD & H Underground Expansion
		ensure no underground activities compromise these structures.
<b>National Environmental Management: Biodiversity Act (Act 10 of 2004)</b>	Provides for management and conservation of biodiversity, protection of threatened ecosystems and species, and norms and standards for ecological management.	The BD/H workings occur beneath wetland ecosystems; therefore, wetland ecological functioning and hydrological patterns must be protected. Groundwater drawdown and wetland monitoring requirements under the IWWMP support compliance with NEM:BA.
<b>Mineral and Petroleum Resources Development Act (Act 28 of 2002)</b>	Regulates mining rights, environmental management (aligned with NEMA), rehabilitation and closure obligations, and sustainable mining practices.	The BD/H project falls within the authorised Klipspruit Mining Right. The mining method change was authorised via Section 102. Compliance with the EMPr, rehabilitation obligations and underground stability requirements is mandatory and integrated with this IWWMP.

In addition to the above, the DWS has developed the National Water Resource Strategy (NWRS) to give effect to Section 5 of the NWA. The second edition of the NWRS (NWRS2, DWA 2013) is the primary mechanism to manage water across all sectors towards achieving national government's development objectives. The water sector vision for the NWRS2 is "Sustainable, equitable and secure water for a better life and environment for all" and is aligned with the vision of South Africa 2030. Towards achieving this vision, the overall goal is: "Water is efficiently and effectively managed for equitable and sustainable growth and development". The NWRS2 strives to achieve three main objectives (DWA, 2013):

- 🌱 Water supports development and the elimination of poverty and inequality;
- 🌱 Water contributes to the economy and job creation;
- 🌱 Water is protected, used, developed, conserved, managed and controlled sustainably and equitably.

The core strategies of the NWRS2 (DWA, 2013) include the following:

- 🌱 Implementation of Equity Policy;
- 🌱 Putting water at the centre of integrated development planning and decision-making;
- 🌱 Ensuring water for equitable growth and development;
- 🌱 Contributing to a just and equitable South Africa;
- 🌱 Prioritizing and ensuring the implementation of water conservation and demand management;
- 🌱 Optimizing and stretching of our available water resources (groundwater, water reuse, desalination (including seawater), water systems optimization and rainwater harvesting);
- 🌱 Committing to the protection of our water resources and ecosystems;

- ✔ Achieving effective and smarter water governance;
- ✔ Embedding sustainable business principles and practices in water resources and systems management;
- ✔ Implementing a water sector investment framework for infrastructure, human resource capacity and institutions;
- ✔ Engaging the private and water use sectors.

Strategic actions have been developed per sector for the key priority areas. Measures to give effect to the strategies and priority areas are discussed in Section 5 of this IWWMP.

### 3.1 Summary of all Water Uses

There are a number of water uses which have been authorised for KPS for various water uses triggered in terms of the NWA. Below is a summary of the authorised water uses.

- ✔ 2012: Licence No. 04/B20G/AG/1531 was issued for water uses:
  - Section 21(a); and
  - Section 21(g).
- ✔ 2016: A General Authorisation (GA) for the Northern Bypass Road was issued;
- ✔ 2016: Licence No. 03/B11F/ACGIJ/4740 was issued, and later amended on 04 July 2018 for water uses:
  - Section 21(a);
  - Section 21(c);
  - Section 21(i);
  - Section 21(g); and
  - Section 21 (j).
- ✔ 2016: Licence No. 24075037, File No. 16/2/7/B100/C186 issued for water uses (supersedes 2006 WUL):
  - Section 21 (a);
  - Section 21 (c);
  - Section 21 (g);
  - Section 21 (i); and
  - Section 21 (j).
- ✔ 2017: Licence No. 03/B20F/ACGIJ/4781 was issued for the water uses:
  - Section 21 (c);

- Section 21 (g);
- Section 21 (i); and
- Section 21 (j).

2018: Licence No. 12/2/B203/32 was issued for the construction of a dam with a safety risk read with GNR 139 of 24 February 2012.

2023: Licence No. 06/B20G/CGIJ/13591 was issued for was issued for the opencast mining of Pits G, and H S

The following proposed activities are triggered according to the geohydrology, wetlands and surface water specialist reports:

- 2018: Licence No. 12/2/B203/32 was issued for the construction of a dam with a safety risk read with GNR 139 of 24 February 2012.
  - 2023: Licence No. 06/B20G/CGIJ/13591 was issued for was issued for the opencast mining of Pits G, and H S
- The following proposed activities are triggered according to the geohydrology, wetlands and surface water specialist reports:
- Section 21(j) is triggered by groundwater ingress to underground workings (Pit BD and H)
  - Section 21(c) & 21(i) are triggered by subsurface interaction beneath wetlands and drainage features

The above water uses are associated with the proposed transition of mining activities at Pit BD and Pit H from opencast to underground methods and represent water uses that require consideration under this Integrated Water and Waste Management Plan. These water uses are informed by the updated Hydrogeological Impact Assessment, Wetland Impact Assessment and Surface Water Impact Assessment and are addressed through the management, mitigation and monitoring measures described in subsequent sections of this IWWMP.

### 3.2 Existing Lawful Water Uses

During the IWULA process development, a legal assessment was carried out for Seriti Power as per the requirements of NWA. In terms of Section 32 of the NWA, an existing lawful water use is defined as any "Water use which has taken place at any time during a period of two years immediately before the date of commencement of the Act (1 October 1996 to 30 September 1998) and which was authorised by or under any law which was in force immediately before the date of commencement of this Act, or which has been declared an existing lawful water use in terms of Section 33 of the Act". While several water uses were identified at Seriti Power before 1998 under previous owners, the lack of verifiable authorizations led to the assumption that no existing lawful water uses apply.

**Table 3-2: Consolidated Table: Authorised Water Uses – Klipspruit Colliery (WUL No. 06/B20G/CGIJ/13591 | WUA No. WU24796)**

NWA Section	Water Use Type	Activity / Infrastructure	Associated Pit / Area	Farm & Portion	Purpose of Water Use	Authorised Volume / Extent
21(c)	Impeding / diverting flow	Contractors' laydown area near wetland	Laydown area	Portion 39, Hartebeeslaagte 325 JS	Construction and operational support	±36.25 ha
21(c) & 21(i)	Impeding / altering watercourse	Open pit mining	Pit H	Portion 4, Hartebeeslaagte 325 JS	Coal extraction near wetland	±206.25 ha
21(c) & 21(i)	Impeding / altering watercourse	Open pit mining	Pit G	Portion 22/11, Wildebeestfontein 327 JS	Coal extraction near wetland	±70.32 ha
21(c) & 21(i)	Impeding / altering watercourse	Open pit mining	Pit S	Portion 9/10, Wildebeestfontein 327 JS	Coal extraction near wetland	±73.53 ha
21(c) & 21(i)	Impeding / altering watercourse	Haul roads	Pit H	Portion 8, Hartebeeslaagte 325 JS	Vehicle access and coal haulage	±4.2 ha
21(c) & 21(i)	Impeding / altering watercourse	Haul roads	Pit G	Portion 22/11, Wildebeestfontein 327 JS	Vehicle access and coal haulage	±3.6 ha
21(c) & 21(i)	Impeding / altering watercourse	Haul roads	Pit S	Portion 9/10, Wildebeestfontein 327 JS	Vehicle access and coal haulage	±3.8 ha

NWA Section	Water Use Type	Activity / Infrastructure	Associated Pit / Area	Farm & Portion	Purpose of Water Use	Authorised Volume / Extent
21(c) & 21(i)	Impeding / altering watercourse	Pipelines to PCDs	Pit H	Portion 8, Hartebeeslaagte 325 JS	Conveyance of pit water	Length ±3 000 m
21(c) & 21(i)	Impeding / altering watercourse	Pipelines to PCDs	Pit G	Portion 22/11, Wildebeestfontein 327 JS	Conveyance of pit water	Length ±197 m
21(c) & 21(i)	Impeding / altering watercourse	Pipelines to PCDs	Pit S	Portion 9/10, Wildebeestfontein 327 JS	Conveyance of pit water	Length ±197 m
21(g)	Disposal of waste	In-pit sump	Pit H	Portion 4, Hartebeeslaagte 325 JS	Collection of contaminated pit water	306 600 m <sup>3</sup> /a
21(g)	Disposal of waste	In-pit sump	Pit G	Portion 22, Wildebeestfontein 327 JS	Collection of contaminated pit water	135 415 m <sup>3</sup> /a
21(g)	Disposal of waste	In-pit sump	Pit S	Portion 10, Wildebeestfontein 327 JS	Collection of contaminated pit water	135 415 m <sup>3</sup> /a
21(g)	Disposal of waste	Overburden backfilling	Pit G	Portion 22/11, Wildebeestfontein 327 JS	Rehabilitation of opencast pit	5 028 800 m <sup>3</sup>
21(g)	Disposal of waste	Overburden backfilling	Pit H	Portion 4, Hartebeeslaagte 325 JS	Rehabilitation of opencast pit	1 419 667 m <sup>3</sup>

NWA Section	Water Use Type	Activity / Infrastructure	Associated Pit / Area	Farm & Portion	Purpose of Water Use	Authorised Volume / Extent
21(g)	Disposal of waste	Overburden backfilling	Pit S	Portion 9/10, Wildebeestfontein 327 JS	Rehabilitation of opencast pit	14 706 960 m <sup>3</sup>
21(g)	Disposal of waste	Dust suppression on mine roads	All mining areas	Multiple portions	Dust control	328 500 m <sup>3</sup> /a
21(j)	Removal of underground water	Dewatering	Pit G	Portion 22, Wildebeestfontein 327 JS	Safe continuation of mining	135 415 m <sup>3</sup> /a
21(j)	Removal of underground water	Dewatering	Pit H	Portion 4, Hartebeeslaagte 325 JS	Safe continuation of mining	306 600 m <sup>3</sup> /a
21(j)	Removal of underground water	Dewatering	Pit S	Portion 10, Wildebeestfontein 327 JS	Safe continuation of mining	135 415 m <sup>3</sup> /a
—	—	<b>Total authorised dewatering</b>	<b>All pits</b>	—	—	<b>577 430 m<sup>3</sup>/a</b>

**Table 3-3: Consolidated Table: Authorised Water Uses – Klipspruit Colliery Water Use Licence No. 24075037**

NWA Section	Water Use Type	Activity / Infrastructure	Associated Area / Facility	Farm & Portion	Purpose of Water Use	Authorised Quantity / Extent
21(a)	Taking water	Abstraction from groundwater boreholes	Klipspruit Colliery operations	Various licensed properties	General mining, construction and operational water supply	<b>73 000 m<sup>3</sup>/a</b> (±200 m <sup>3</sup> /day avg.)

NWA Section	Water Use Type	Activity / Infrastructure	Associated Area / Facility	Farm & Portion	Purpose of Water Use	Authorised Quantity / Extent
21(c)	Impeding / diverting flow	Watercourse crossing by conveyor	Saalklaspruit	Klipfontein 3 IS	Coal conveyance infrastructure	As per approved designs
21(c)	Impeding / diverting flow	Watercourse alteration	Unnamed tributary of Saalklaspruit	Klipfontein 3 IS	Facilitation of coal mining	As per approved designs
21(i)	Altering watercourse	Mining through non-perennial streams	Multiple stream crossings	Klipfontein 3 IS	Coal extraction	Stream crossings ×2
21(i)	Altering watercourse	Undermining streams	Southern tributary of Wilge River	Klipfontein 3 IS	Bord-and-pillar mining	As per approved method
21(g)	Disposal of waste	Wastewater containment facilities	Filling point sump	Portion 14, Klipfontein 3 IS	Containment of contaminated water	25 000 m <sup>3</sup>
21(g)	Disposal of waste	Wastewater containment facilities	ROM stockpile	Portion 14, Klipfontein 3 IS	Containment of contaminated runoff	229 950 m <sup>3</sup>
21(g)	Disposal of waste	Wastewater containment facilities	Main Pit ROM	Remaining Extent Klipfontein 3 IS	Containment of contaminated runoff	210 000–250 000 m <sup>3</sup>
21(g)	Disposal of waste	Wastewater containment facilities	Bankfontein ROM	Portion 4, Smaldeel 1 IS	Containment of contaminated runoff	126 000–150 000 m <sup>3</sup>

NWA Section	Water Type	Use	Activity / Infrastructure	Associated Area / Facility	Farm & Portion	Purpose of Water Use	Authorised Quantity / Extent
21(g)	Disposal of waste	of	Wastewater containment facilities	Main Pit ROM 2	PTN 13, Klipfontein 3 IS	Containment of contaminated runoff	184 800–220 000 m <sup>3</sup>
21(g)	Disposal of waste	of	Wastewater containment facilities	Emergency bypass	Portion 4, Smaldeel 1 IS	Emergency pollution control	504 000–60 000 m <sup>3</sup>
21(g)	Disposal of waste	of	Wastewater containment facilities	Tailings Discard Facility	Portions 12, 13, 14 Klipfontein 3 IS	Storage of tailings-related water	1 116 752 m <sup>3</sup>
21(g)	Disposal of waste	of	Disposal of effluent	Effluent discharge point	Portion 14, Klipfontein 3 IS	Managed effluent disposal	18 000 m <sup>3</sup> /a
21(g)	Disposal of waste	of	Dust suppression	Mine roads and operational areas	Multiple portions	Dust control	<b>229 950 m<sup>3</sup>/a</b>
21(j)	Removal of groundwater	of	Dewatering	Open pit and underground workings	Klipspruit Colliery	Safe mining operations	As required for safety
21(j)	Removal of groundwater	of	Discharge / disposal of abstracted groundwater	Pollution control system	Klipspruit Colliery	Controlled disposal of mine water	Linked to 21(g) facilities

### 3.3 Relevant Exemptions

The Unwabu Project involves the underground expansion of Pits BD and H within the existing Klipspruit Mining Right area. The project relies entirely on existing surface and underground infrastructure, and no new stockpiles, residue facilities, discard dumps or overburden placement areas will be established as part of the underground activities. As such, the operation will continue to manage underground ingress water, mine residue and wastewater through the authorised and existing KPS water management system.

Given the nature of the project, being strictly underground, the only exemption relevant to this IWWMP relates to the manner in which underground mining interacts with certain regulatory requirements under GN704, specifically where underground workings extend beneath or adjacent to recognised watercourses or wetland systems. This interaction occurs subsurface only, with no surface disturbance.

Accordingly, an exemption is sought only where necessary to support the authorisation of underground mining activities that intersect the hydrogeological influence zones of watercourses, without triggering prohibited activities at surface.

#### 3.3.1 Application for Exemption in terms of Regulation 704 of the NWA

Regulation 704 (Government Gazette 20118 of 4 June 1999), promulgated under Section 26(1) of the NWA, sets out rules for protecting water resources from pollution associated with mining activities. The regulations govern issues such as water monitoring, dirty-water containment, protection of riparian habitats, and the management of residue or waste that may impact water quality.

Section 26 requires that regulations must:

- 🌿 ensure water entering or leaving a water resource is monitored and recorded;
- 🌿 regulate or prohibit activities that may adversely affect water resources or riparian habitats;
- 🌿 outline required outcomes for the management of waste before it is discharged or deposited.

Subsection 26(4) guides the Minister to consider factors including sustainable water use, resource protection, prevention of wasteful use, and effective monitoring.

Regulation 3 of GN704 allows the Minister to grant written exemptions from specific regulations, namely Regulations 4, 5, 6, 7, 8, 10, or 11, on application or at the Minister's discretion.

For the Unwabu underground expansion, exemption is sought only to the extent that underground workings intersect beneath or within the regulated buffer zones of watercourses. While these areas are hydrologically sensitive, the project does not involve:

- 🌿 surface residue placement,
- 🌿 overburden use,
- 🌿 new impoundments,
- 🌿 new dirty-water facilities, or

- activities that would cause surface pollution.

The operations remain entirely underground and fully contained within the authorised mining right area.

In accordance with Operational Guideline M6, any exemption that aligns with an authorised water use under the NWA may be addressed through the WULA process. The current WUL application therefore serves as the formal motivation to exempt the underground workings from specific GN704 restrictions where mining extends beneath designated watercourses.

This exemption relates only to the subsurface interaction of mining with watercourses relevant to Section 21(c) and 21(i) water uses, and does not extend to any surface-based activities.

Underground mining at Pits BD and H extends beneath or immediately adjacent to hydrologically sensitive areas, including hillslope seepage wetlands and channelled valley-bottom wetlands. Although there is no surface disturbance, the sub-surface workings intersect the hydrogeological influence zone of these watercourses. In terms of GN704, certain activities within or near a watercourse, such as altering the bed, banks or characteristics, are restricted unless exempted by the Minister.

### 3.4 Motivation for the 21(c) & 21(i) Exemption (GN704)

For Project Unwabu, the interaction triggering the exemption is entirely underground. The mining occurs at depth and does not involve any direct modification of the surface bed, banks or riparian area. There is no excavation of wetland soils, no diversions of surface water, and no construction of infrastructure within 100 m of a watercourse. The only interaction is subsurface, where underground pillars, voids and ventilation headings may influence groundwater flow paths connected to the wetland systems. The motivation for exemption is supported by the conclusions of the final Wetland Impact Assessment, Hydrogeological Impact Assessment and Surface Water Impact Assessment, which confirm that potential interactions between underground mining activities and wetlands or watercourses are indirect, subsurface in nature, and can be effectively managed through existing water management infrastructure, monitoring programmes and mitigation measures.

Given that:

- GN704 was primarily drafted to address surface-based impacts associated with open-cast mining, residue deposition and dirty-water management,
- no surface disturbance to wetlands or watercourses is proposed under this project,
- the underground workings remain within the authorised mining right area, and
- the risks arise only through underground undermining
- the exemption requested is both reasonable and aligned with the intent of the regulation, i.e., to prevent pollution and protect water resources. The mine's groundwater model, monitoring programme and mitigation measures confirm that underground mining will not compromise the ecological functioning or hydrological integrity of the wetlands located above or adjacent to the workings.

Therefore, the WUL amendment application serves as the mechanism through which Seriti Power formally requests exemption from the relevant GN704 restrictions applicable to subsurface watercourse interaction under Section 21(c) and (i).

**Table 3-4: GN704 Compliance Table**

Regulation	Requirement	Applicability to Unwabu Project	Compliance Status
Reg. 4	Clean/dirty water separation	Not triggered – no new surface disturbed area; existing systems remain effective.	Fully compliant through existing KPS infrastructure.
Reg. 5	Prohibition on using residue or pollutants for construction	Not applicable – no residue use, no surface construction, no dams, roads, or embankments.	Compliant; exemption not required.
Reg. 6	Requirements for dams/impoundments	Not applicable – no new dams or impoundments.	Compliant.
Reg. 7	Measures to prevent water resource contamination	Relevant at operational level but addressed through existing water management system (PCDs, bunding, pumping).	Fully compliant.
Reg. 8	Mining restrictions within 100 m of watercourses	Triggered only <b>subsurface</b> ; no surface activity occurs within the 100 m buffer.	Requires exemption for underground-only encroachment.
Reg. 10	Protection of water systems from pollution	Fully applicable; managed under existing WUL and infrastructure.	Compliant.
Reg. 11	Monitoring and record keeping	Fully applicable; met through underground flow meters, borehole monitoring, reporting systems.	Compliant.

Only Regulation 8 requires exemption, and only due to underground encroachment beneath watercourses. All other requirements are already met through established infrastructure, no new disturbances, and existing mine-wide water management practices.

The Unwabu underground expansion presents low risk to both groundwater and surface water systems for several reasons:

- 🌿 No new surface disturbance occurs; all activities take place at depth using existing infrastructure.
- 🌿 The wetlands and surface watercourses remain physically intact, with no excavation, clearing, stockpiling or construction within their boundaries or buffers.
- 🌿 Groundwater inflows are controlled through a designed dewatering system, routed to existing pollution control infrastructure (PCD4) that is already authorised in the WUL.

- ☛ Subsidence is not expected, as the bord-and-pillar method maintains structural stability and substantial pillar support.
- ☛ Hydrogeological modelling indicates limited drawdown, with impacts attenuating before reaching the wetland root zone in most areas.
- ☛ A comprehensive groundwater and surface water monitoring programme remains in place to detect any deviation early.
- ☛ The entire operation functions within the prescribed KPS water management system, which has adequate storage, monitoring and containment capacity.

Consequently, while the underground workings intersect the hydrogeological influence zones of certain wetlands, there is no resultant surface impact, no pollution risk directly attributable to underground mining, and no alteration of the wetland bed or banks. The only potential effect is a manageable groundwater drawdown response, which is well within expected hydrological behaviour for bord-and-pillar underground operations.

### 3.5 Generally Authorised Water Uses

In terms of Section 22(1) of the NWA a person may use water without a licence if that water use is permissible in terms of a General Authorisation (GA) issued under Section 39 of the Act. Seriti Power has been issued with the following GA's:

- ☛ Northern Bypass Road on 12 December 2016 (Reference No. 27/2/2/B20G/332); and
- ☛ Construction of gravel road to relocate Dragline over a Wetland 2021.

In terms of the current application, an assessment was done of the General Authorisation under the NWA, namely:

- ☛ General Authorisation No. 399, dated 26 March 2004 in terms of Sections 21 (a), (b), (e), (f) (g) and (h) water uses;
- ☛ General Authorisation No. 398, dated 26 March 2004 in terms of Section 21 (j) water use;
- ☛ General Authorisation No. 1199, dated 18 December 2009 in terms of Sections 21 (c) and (i) water uses; and
- ☛ General Authorisation No. 1198, dated 18 December 2009 in terms of Sections 21(c) and (i) for the purpose of rehabilitating a wetland for conservation purposes.

The General Authorisation does not apply in instances where an application must be made for a water use licence for multiple water uses as defined in Section 21 of the Act that may be associated with an activity.

### 3.6 New Water Uses to be Licenced

The water uses for the proposed activities that require authorisation are presented in Table 3-3. The WULA forms have been submitted on the eWULAAS online submission. The WULA water balance schematic diagram is provided in Section 5.3.

Future proposed activities and associated Section 21 water uses included in this WULA are as follows:

- ☛ Section 21(c): Impeding or diverting the flow of water in a watercourse.

- 🌿 Section 21(i): Altering the bed, banks, course, or characteristics of a watercourse.
- 🌿 Section 21(j): Removing, discharging, or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

**Table 3-5: Summary of all water uses to be licenced**

Water Use category	Water Use Description	Property	Volumes (if Applicable)	Coordinates	
				Latitude	Longitude
Section 21(j): removal, discharge, or disposal of underground water that is necessary for the continuation of an activity or for the safety of people	Dewatering of ingress water from Pit BD to Pollution Control Dam 4 (PCD4) [flow meter numbers: CL241-FQI001 (GP111A) and CL241-FQI003 (GP111B)]	Twefontein 328 JS Portion 5/328	3 551 m3/day  1 296 115 m3/annum	25°59'14.56"S	29° 4'22.20"E
Section 21(c) and (i): concerns impeding or diverting the natural flow of water; and altering the bed, banks, course, or characteristics of a watercourse	Underground mining encroaching on Hillslopes Seepage and Channelled Valley bottom wetlands. Seam 2 final extent boundary edge (as the closest to surface) referenced	Twefontein 328 JS Portion 8/328	Not Applicable	Start	
		Hartebeestlaagte 325 JS		25°59'12.40"S	29° 5'50.95"E
		Portion 40/325		End	
				25°55'59.82"S	29° 4'50.54"E
Water Uses	Latitude	Longitude	Farm Name	Wetland Description	
Section 21 (c) and (i)	26° 0' 22.720" S	29° 5' 15.799" E	Twefontein 328 JS RE/1/328	HGM Unit 1: Hillslope Seepage Wetland Connected to a Watercourse	
Section 21 (c) and (i)	25° 59' 19.621" S	29° 5' 0.821" E	Twefontein 328 JS 6/328	HGM Unit 2: Hillslope Seepage Wetland Connected to a Watercourse	
Section 21 (c) and (i)	25° 58' 26.726" S	29° 4' 57.542" E	Twefontein 328 JS RE/328	HGM Unit 3: Hillslope Seepage Wetland Connected to a Watercourse	
Section 21 (c) and (i)	25° 57' 40.297" S	29° 5' 38.090" E	TWEEFONTEIN 328 JS 4/328	HGM Unit 6: Channeled Valley Bottom Wetland	
Section 21 (c) and (i)	25° 57' 39.673" S	29° 4' 14.936" E	HARTEBEESTLAAGTE 325 JS RE/325	HGM Unit 4: Hillslope Seepage Wetland Connected to a watercourse	
Section 21 (c) and (i)	25° 56' 52.193" S	29° 2' 52.452" E	HARTEBEESTLAAGTE 325 JS 4/325	HGM Unit 5: Hillslope Seepage Wetland Connected to a Watercourse	

### 3.7 Waste Management Activities (NEM: WA)

Waste is regulated under the NEM: WA as well as the National Environmental Management: Waste Amendment Act, 2014 (Act No. 26 of 2014) (NEM: WA), with the exception of certain listed exclusions.

NEM: WA follows the principle that waste generation is to be avoided, or if it cannot be avoided, that it be reduced, reused, recycled or recovered, and as a last resort treated and/or safely disposed of (described further in Section 5.6).

Although the Minister of Mineral Resources is the licensing authority for residue stockpiles and residue deposits, their management must be in accordance with the NEM: WA Regulations as prescribed by the Minister of Environmental Affairs (DEA). The list of Waste Management Activities that may require licensing in terms of NEM: WA has been revised as follows:

- 🌿 on 29 November 2013 (Government Notice (GN) 921, Government Gazette No 37083) and exclude treatment of effluent, wastewater or sewage,
- 🌿 on 2 May 2014 (GN332, Government Gazette No. 37604) to exclude remediation of contaminated land, now covered under Norms and Standards;
- 🌿 on 24 July 2015 (Government Gazette GG 39020, GN: R633) to include residue stockpiles and residue deposits.

Regulations that have relevance to the planning and management of mine residues and stockpiles and general waste management include the following:

- 🌿 Government Gazette No. 39020, GN: R632, 24 July 2015: deals with characterisation and classification of the residue; investigation and the selection of sites; design; assessment/prediction of impacts; analysis of risk relating to the management of residue stockpiles and deposits; duties of permit holders; monitoring and reporting; dust management; and decommissioning, closure and post-closure management.
- 🌿 Government Gazette 41920, GN: R990, 21 Sep 2018: Amendment to GNR632 to allow for pollution control measures required for residue stockpiles and deposits to be determined on a case-by-case basis, based on a risk analysis conducted by a competent person.
- 🌿 National Norms and Standards in Government Gazette No. 36784, 23 August 2013 for Waste Classification and Management (GN R364), Assessment of Waste for Landfill Disposal (GN R365) and Disposal of Waste to Landfill (GN R636).
- 🌿 National Norms and Standards in Government Gazette No 37083, 29 November 2013 for Storage of Waste (GN 926). GN926 require that general and hazardous waste storage facilities that can handle in excess of 100m<sup>3</sup> and 80m<sup>3</sup> of waste continuously, respectively should be registered. Biannual internal audits and biennial external audits of the registered facilities against the requirements of GN926 are required.

- National Norms and Standards in Government Gazette No. 37603, 2 May 2014 for Remediation of Contaminated Land and Soil Quality in the Republic of South Africa (GN331). A Site Assessment Report may be required for the land where the soil contamination is assessed in regard to the Norms and Standards.

Regulations that have relevance to the planning and management of mine residues and stockpiles and general waste management include the following:

- Government Gazette No. 39020, GN: R632, 24 July 2015: deals with characterisation and classification of the residue; investigation and the selection of sites; design; assessment/prediction of impacts; analysis of risk relating to the management of residue stockpiles and deposits; duties of permit holders; monitoring and reporting; dust management; and decommissioning, closure and post-closure management. – when the National Environmental Management Laws Amendment Bill is promulgated, these will be deemed to have been promulgated in terms of NEMA.
- Government Gazette 41920, GN: R990, 21 Sep 2018: Amendment to GNR632 to allow for pollution control measures required for residue stockpiles and deposits to be determined on a case-by-case basis, based on a risk analysis conducted by a competent person.
- National Norms and Standards in Government Gazette No. 36784, 23 August 2013 for Waste Classification and Management (GN R364), Assessment of Waste for Landfill Disposal (GN R365) and Disposal of Waste to Landfill (GN R636). The Norms and Standards for waste required wastes to be evaluated within 18 months to three years of the date at which the legislation was promulgated i.e. by August 2016.
- National Norms and Standards in Government Gazette No 37083, 29 November 2013 for Storage of Waste (GN 926). GN926 require that general and hazardous waste storage facilities that can handle in excess of 100m<sup>3</sup> and 80 m<sup>3</sup> of waste continuously, respectively should be registered. Biannual internal audits and biennial external audits of the registered facilities against the requirements of GN926 are required.
- National Norms and Standards in Government Gazette No. 37603, 2 May 2014 for Remediation of Contaminated Land and Soil Quality in the Republic of South Africa (GN331). A Site Assessment Report may be required for the land where the soil contamination is assessed in regard to the Norms and Standards.

### 3.8 Other Authorisations (EIAs, EMPs, RODs, Regulations)

Seriti Power (Pty) Ltd holds a valid Environmental Authorisation (EA) issued by the Department of Mineral Resources and Energy (DMRE) in terms of the National Environmental Management Act (NEMA) for the change in mining method from opencast to underground for a number of properties that form part of the KPS mining right, including Tweefontein 328 JS and Hartebeestlaagte 325 JS, where the Unwabu underground mining activities (Pits BD and H) are located.

The EA grants authorisation for the underground mining method across the remaining KPSX and KPSS reserves and confirms that environmental impacts associated with the change in mining method have been assessed and can be appropriately managed. This includes compliance with heritage, water, waste, air quality, rehabilitation and monitoring requirements.

The EA includes general and specific conditions relating to:

- 🌿 protection of sensitive environments,
- 🌿 compliance with all other statutory approvals,
- 🌿 groundwater and surface water monitoring,
- 🌿 emergency response and pollution incident reporting,
- 🌿 rehabilitation and closure planning, and
- 🌿 annual environmental auditing and reporting.

The EA forms a foundational regulatory instrument supporting this IWWMP.

### 3.8.1 Mining Right (MR) and Section 102 Amendments

Seriti Power operates under a valid Mining Right issued in terms of the MPRDA. The mining right covers all properties relevant to the Unwabu underground expansion. The change in mining method was formally incorporated through a Section 102 amendment, as referenced in the EA conditions and listing notices triggered in the environmental assessment.

The Unwabu underground project is therefore fully aligned with the approved mining right and its authorised sequence of mining areas.

## 4 Risk Assessment/ Best Practice Assessment

Mining activities can have a wide variety of different impacts, often occurring over different time and spatial scales. Certain impacts will occur immediately whilst others will take place gradually; the extent of these impacts can also range from scarcely perceptible to highly obtrusive. Similarly, the nature of the impact can also vary widely depending on the type of physical environment, the size of the development and the perceptions and values of each of the affected parties.

The existing ecological and other information were reviewed to assess the present status of the natural ecological system and the extent to which they have already been modified. This background information formed the basis on which the conservation status of the study area was determined. Against this background, the extent, severity, probability and duration of any impacts likely to arise as a result of the different mining activities were estimated. The impact of the proposed and existing mining activities on terrestrial ecosystems was assessed during a field evaluation of the mining property. A specific environmental objective has been set for each one of the environmental aspects of the operation to ensure that the impacts of the activities can be minimized.

In order to address these issues and to provide a basis for comparison of the different impacts associated with the mining activities, several standard definitions and approaches were used.

The identified impacts as well as the impact assessment methodology are taken from the approved EMPR.

The Risk/Impact Matrix is based on the DWS 2015 publication: Section 21(c)&(i) Water use Risk Assessment Protocol. The environmental risk/impact of any aspect is determined by a combination of parameters associated with the risk/impact. Each parameter connects the physical characteristics of an impact to a quantifiable value to rate the environmental risk.

Impact assessments were conducted based on a methodology that includes the following:

- ✔ Clear processes for impact identification, and evaluation;
- ✔ Specification of the impact identification techniques;
- ✔ Criteria to evaluate the significance of impacts;
- ✔ Design of mitigation measures to lessen impacts;
- ✔ Definition of the different types of impacts (indirect, direct, or cumulative); and
- ✔ Specification of uncertainties.

After all risks/impacts have been identified, the nature of each impact can be assessed. The risk/impact assessment considers the physical, biological, socio-economic, and cultural information and will then estimate the likely parameters and characteristics of the impacts. The impact prediction will aim to provide a basis from which the significance of each risk/impact can be determined and appropriate mitigation measures can be developed.

The risk assessment methodology is based on defining and understanding the three basic components of the risk, i.e. the source of the risk, the pathway, and the target that experiences the risk (receptor).

A summary of the water-related impacts over the different phases of the project is presented in this section indicating the most significant impacts on water resources in the Project. This section has been referenced from DWA Risk-Based Water Use Authorisation Approach and Delegation Guidelines.

To assess each of the factors for each impact, the ranking scales as contained in Table 4-1 were used

**Table 4-1: Ranking scales for risk assessment**

<b>Severity</b>	
<b>Insignificant / non-harmful</b>	1
<b>Small / potentially harmful</b>	2
<b>Significant / slightly harmful</b>	3

<b>Severity</b>	
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
<b>Spatial Scale</b>	
Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond secondary catchment or provinces)	4
Global (impacting beyond SA boundary)	5
<b>Duration</b>	
One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5
<b>Frequency of the activity</b>	
Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5
<b>Frequency of the incident/ impact</b>	

Severity	
Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5
Legal Issues	
No legislation	1
Fully covered by legislation (wetlands are legally governed)	5
Detection	
Immediately	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered	5

The maximum value of significance is 300 as shown in Table 4-2 below. Environmental impact/risks could therefore be rated as either high (H), moderate (M), or low (L) significance on the following basis:

- 🌿 More than 170 points indicate high (H) environmental significance;
- 🌿 Between 56 – 169 points indicate moderate (M) environmental significance;
- 🌿 Less than 55 points indicate low (L) environmental significance

**Table 4-2: Rating Class**

Rating	Class	Management Description
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.

56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and requires specialist input. Wetlands are excluded.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

The methodology determines the environmental significance using the following equations indicated in Table 4-3 below:

**Table 4-3: Calculations**

<b>Consequence =</b>	<b>Severity + Spatial Scale + Duration</b>
<b>Likelihood=</b>	Frequency of Activity + Frequency of Incident + Legal Issues + Detection
<b>Significance \Risk=</b>	Consequence X Likelihood

The consequence of an impact can be derived from the following factors:

- 🌿 Spatial scale;
- 🌿 Duration of impact; and
- 🌿 Severity/magnitude.

Significance is obtained by multiplying the consequence of the impact with the probability of occurrence, as follows:

- 🌿 Significance = Consequence x Likelihood as shown in Table 4-3
- 🌿 The maximum score that can be obtained is 300 significance points (Table 4-2).

Additionally, impacts/risks were determined to be negative or positive based on how they affect the environment.

- 🌿 Positive Environmental Impacts: Those activities that result in the overall environmental benefit;
- 🌿 Negative Environmental impacts: Activities that result in an overall degradation of the environment.

## 5 Present Environmental Situation

### 5.1 Site Climate and Meteorological Overview

The project site, boasts a subtropical climate characterized by distinct seasonal changes. Summers, from October to March, bring hot and humid weather, with temperatures reaching highs of 30°C to 35°C. Winters, lasting from April to September, offer milder temperatures averaging around 20°C during the day. Rainfall is predominant in summer, with thunderstorms and heavy downpours

common, while winters tend to be drier. The region experiences moderate to strong winds, often from the east or southeast. Most climatic data was obtained from the Bethal weather station with record of more than 60 years except for rainfall data obtained from the Ogies rainfall station and wind data from the air quality specialist report for the Witbank area.

**Table 5-1: Climate data for the area associated with the proposed activity**

Month	Mean Monthly Temperature (C)	Average Daily Temperature		Average Monthly Rainfall (Ogies Rainfall Station)		A-pan Evaporation (mm)
		Max	Min	Distribution %	Monthly rain	
Jan	20	26	13	18	128	180
Feb	19	24	13	14	98	153
Mar	18	25	11	11	78	150
Apr	15	22	8	6	42	111
May	12	20	4	2	18	94
Jun	8	17	0	1	9	81
Jul	9	17	0	1	7	90
Aug	12	20	3	1	10	135
Sept	15	23	7	3	23	176
Oct	17	25	10	10	73	191
Nov	19	25	11	16	116	170
Dec	19	25	13	17	119	198
<b>Annual</b>	<b>15</b>	<b>23</b>	<b>8</b>	<b>100</b>	<b>720</b>	<b>1729</b>

### 5.1.1 Precipitation/Rainfall

The project site receives the bulk of its precipitation during the summer months, characterized by afternoon thunderstorms and occasional heavy rainfall. The annual rainfall totals range from approximately 600 to 800 mm, with variations from year to year. The dry winter season sees significantly less rainfall compared to the summer months.

### 5.1.2 Evaporation

The catchment falls within rainfall zone B2C with a Mean Annual Precipitation (MAP) of 698 mm, and evaporation zone 4A with a Mean Annual Evaporation (MAE) of 1700 mm. The monthly distribution of the rainfall and evaporation are presented in Table 5-2 shows that the evaporation in the area is relatively higher than the amount of rainfall this catchment receives.

**Table 5-2: Monthly Rainfall and Evaporation Distribution around the project site.**

Month	Rainfall	Evaporation
Oct	69	183
Nov	114	173
Dec	115	190
Jan	124	187
Feb	92	156
Mar	85	154
Apr	41	118
May	16	100

Month	Rainfall	Evaporation
Jun	8	81
Jul	6	89
Aug	6	117
Sep	20	152
<b>Average</b>	<b>58</b>	<b>142</b>
<b>Annual</b>	<b>698</b>	<b>1700</b>

### 5.1.3 Topography and Drainage

Surface landform in the area is characterised by gently undulating hills and valley. Large portion of the mining right boundary comprises of gently slope that reaches 4°, with some localities especially along the river valley and ridges that comprises of slope varying from 4° and 11.3° (Digby wells, 2018). Figure 4-1 shows the surface elevation of the area. Surface elevation of the mine area ranges from 1415 – 1649 mamsl. The southern portion of the mining right boundary consist of high elevation that decreases towards the north and northwest of the mine. A ridge in the southern boundary of the mine is evident, with an orientation of northeast to southwest direction. Small portion of the mine boundary in the east consist of an elevation rising from an elevation of 1649 mamsl and decreases towards the southeast of the mine.

The mine is located in the Olifants WMA. The mine boundary spans across three quaternary drainage regions namely, B20G, B11F, and B20F (Figure 5-2). The mine is drained by several rivers that includes the Saalboomspruit, The Tweefonteinspruit, and Noupport River. Large portion of the mine is drained by northerly flowing rivers that originates within the ridge in the south. This ridge forms a surface water divides between the Saalboomspruit, and Tweefonteinspruit and Noupport River. Both Tweefonteinspruit and Noupport River drains towards the east of the mine.

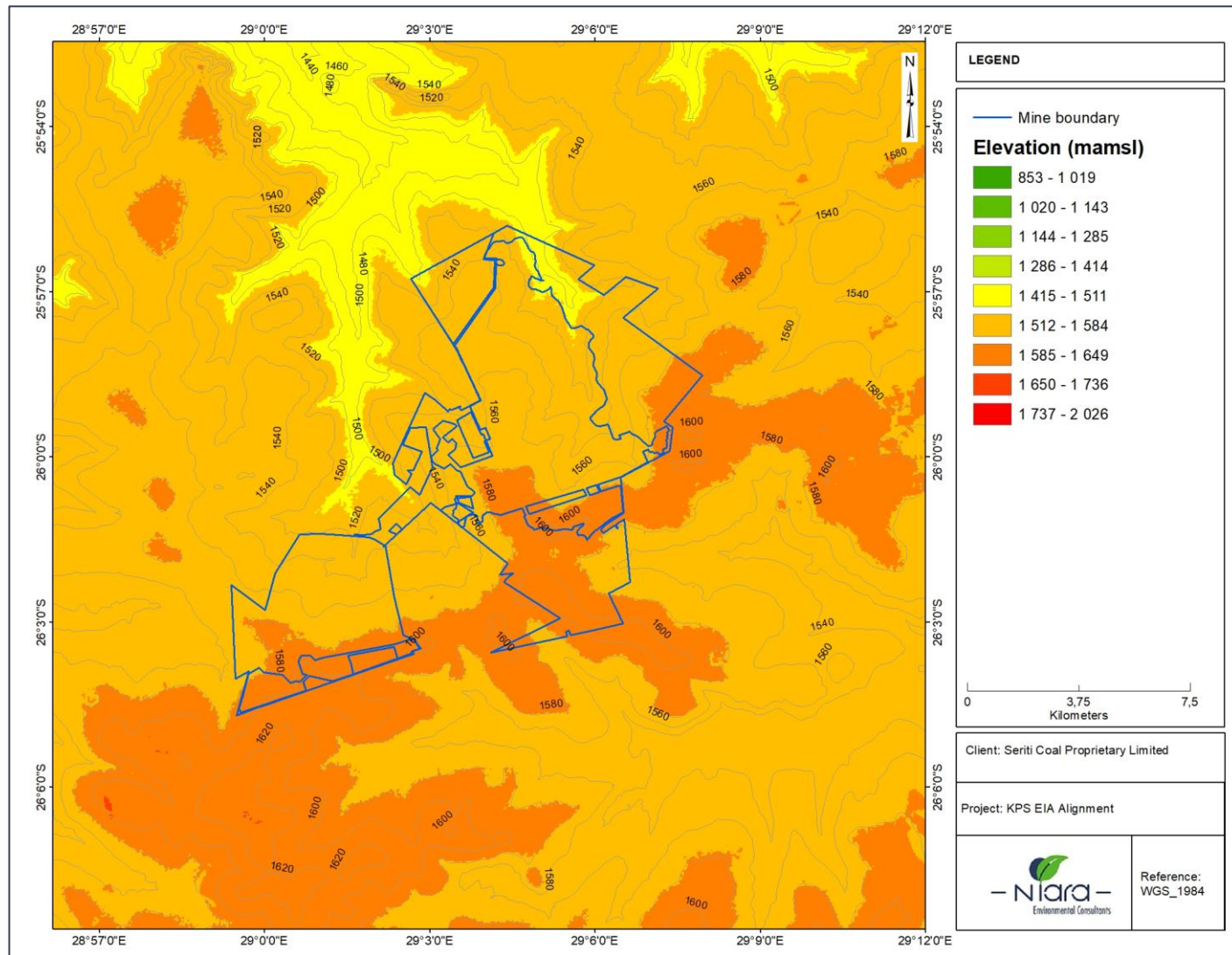


Figure 5-1: Surface elevation

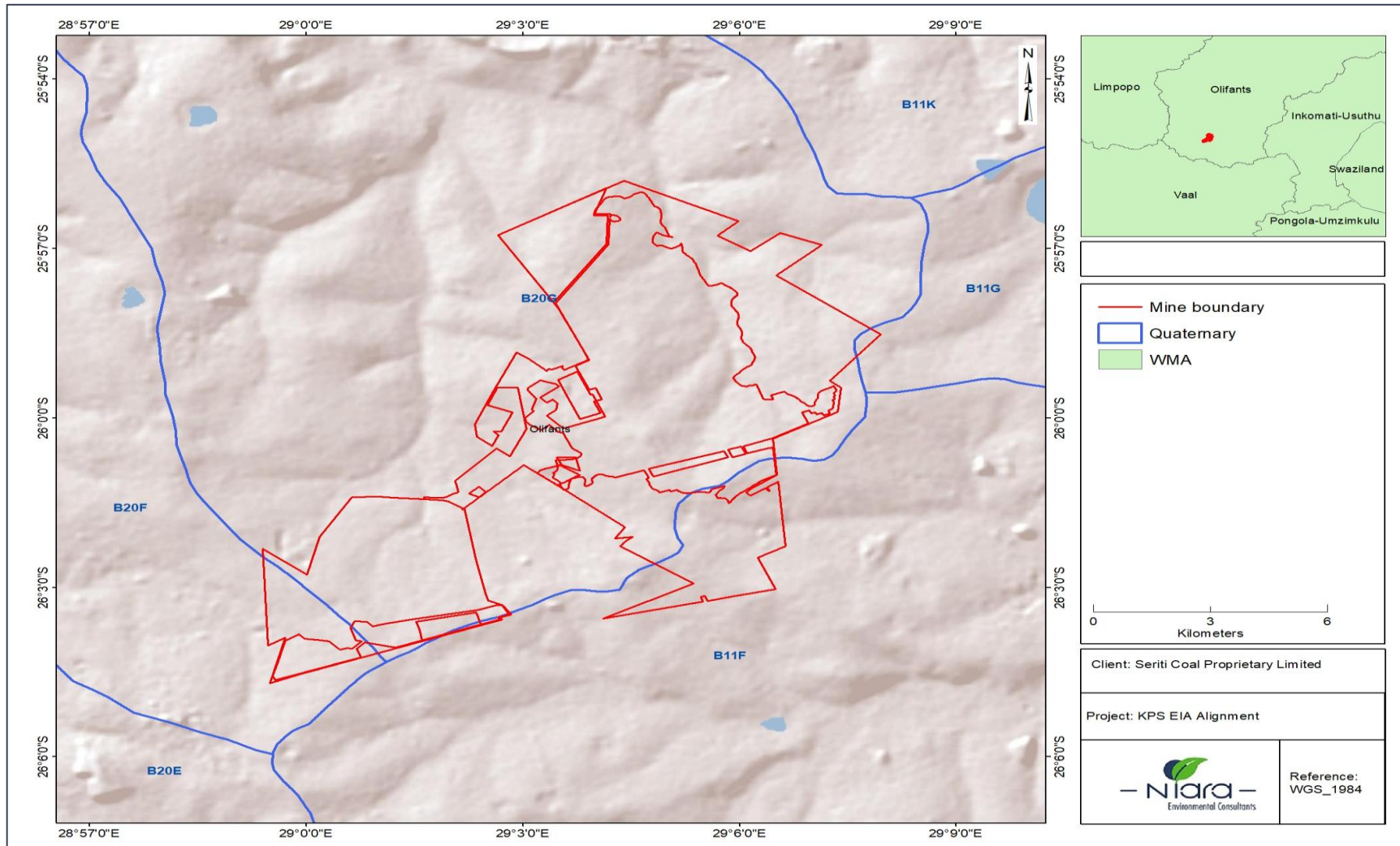


Figure 5-2: WMA and associated quaternary drainage.

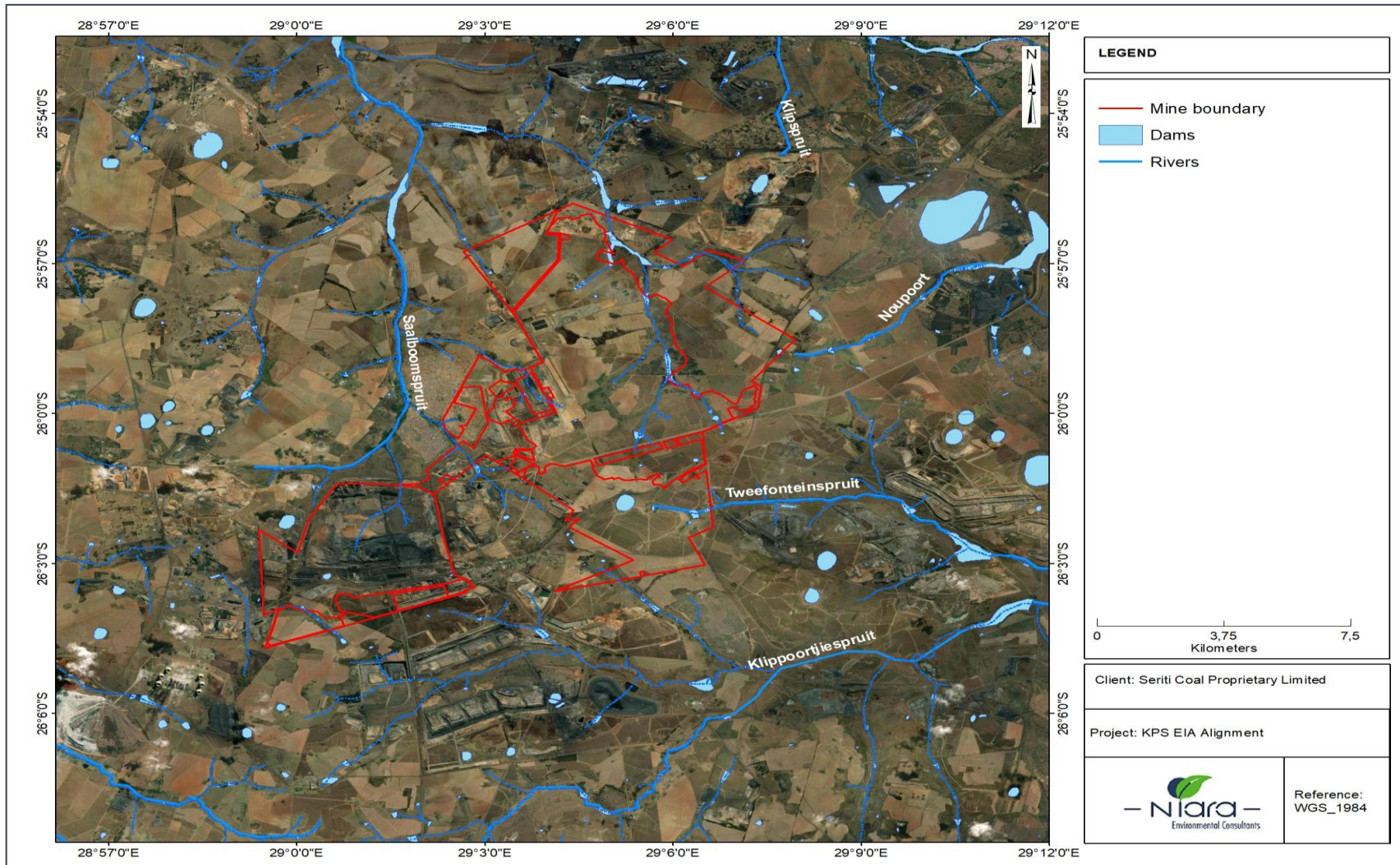


Figure 5-3: Surface drainage

#### 5.1.4 Vegetation

According to 'The Vegetation of South Africa, Lesotho, and Swaziland' (Mucina and Rutherford, 2006), KPS and KPSX fall within the Eastern Highveld Grassland and the Rand Highveld Grassland vegetation types (Figure 5-4). Both of these vegetation types are considered nationally endangered, with no areas conserved and many parts altered primarily by cultivation.

The Eastern Highveld Grassland is located in the Mpumalanga and Gauteng provinces, occurring in the plains between Belfast in the east and the eastern side of Johannesburg in the west, extending southwards to Bethal, Ermelo, and west of Piet Retief. Its altitude ranges from 1300m to 1780m above mean sea level. This vegetation type is characterized by short, dense grassland dominated by typical highveld grass species such as *Aristida*, *Digitaria*, *Eragrostis*, and *Themeda*. Small, scattered rocky outcrops with wiry, sour grasses and some woody species like *Acacia caffra*, *Celtis africana*, and *Parinari capensis* are also present. The conservation status of the Eastern Highveld Grassland is very poor, with large parts either currently cultivated or previously ploughed. The remaining untransformed vegetation occurs as patchy remnants that are heavily overgrazed. Approximately 44% of the Eastern Highveld Grassland has already been transformed by cultivation, urban sprawl, mining, plantations, and dams, with a conservation target of 24%.

Rand Highveld Grassland occurs in Gauteng, North-West, Free State, and Mpumalanga provinces, between rocky ridges from Pretoria to Witbank, and extending onto ridges of the Stoffberg and Roosenekal regions, as well as west of Krugersdorp, centered in the vicinity of Derby and Potchefstroom, and extending southwards and northeastwards from there. Its altitude ranges from 1300m to 1760m. Rand Highveld Grassland is also considered endangered and is poorly conserved, with only 1% of its area protected. Small patches are preserved in statutory reserves such as Kwaggavoetpad, Van Riebeeck Park, Bronkhorstspuit, and Boskop Dam Nature Reserve, and in private conservation areas like Doornkop, Zemvelo, Rhenosterpoort, and Mpopomeni. Almost half of this vegetation type has been transformed mostly by cultivation, plantations, urbanisation, or dam building. Cultivation may have also impacted an additional portion of the surface area, where old lands are currently classified as grasslands in land cover classifications. Poor land management has led to the degradation of significant portions of the remainder of this unit. Scattered aliens, most prominently *Acacia mearnsii*, occur in about 7% of this unit, and only about 7% has been subjected to moderate to high erosion levels (Mucina & Rutherford, 2006).

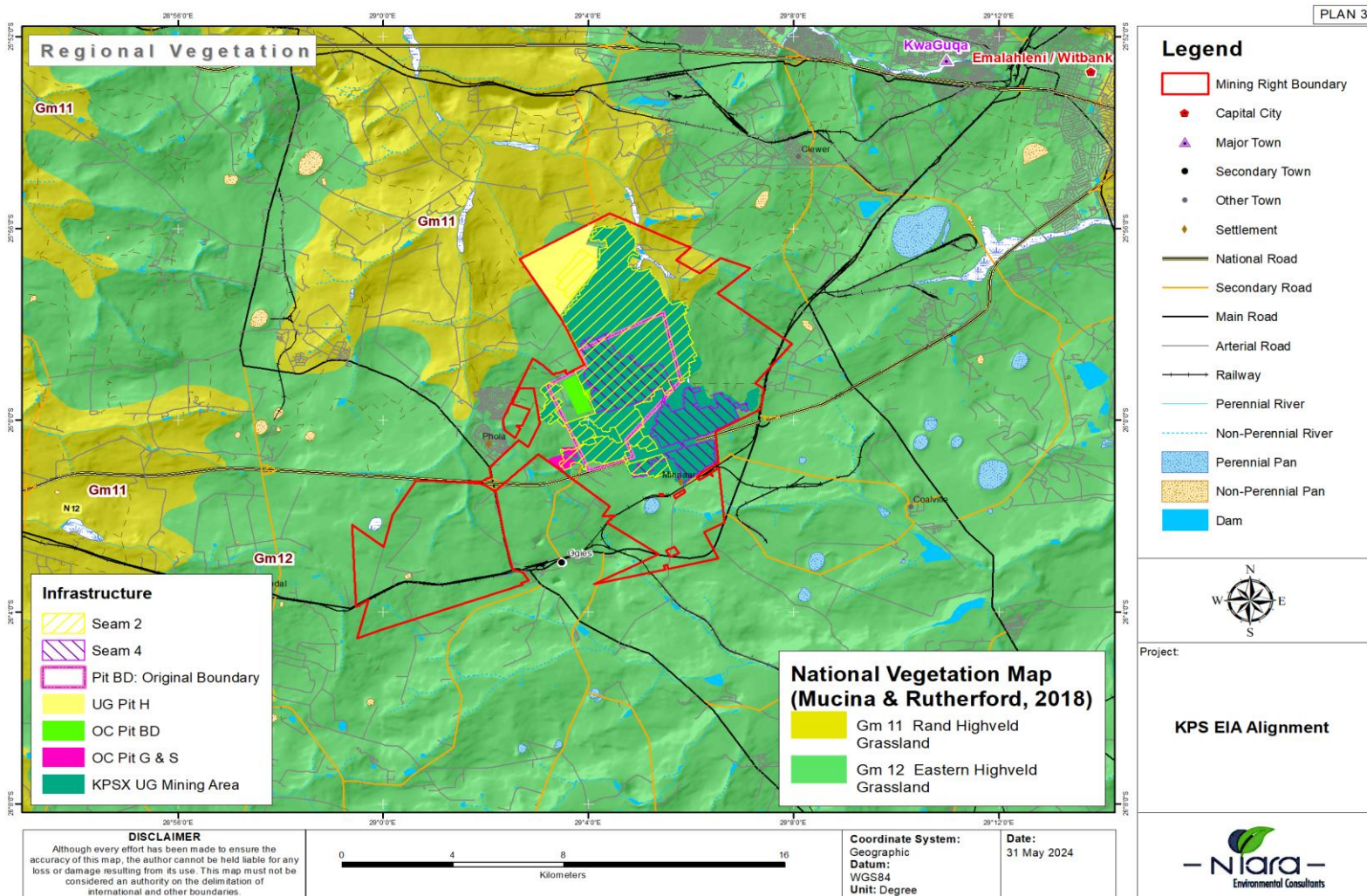


Figure 5-4: Regional Vegetation

## 5.2 Surface Water

### 5.2.1 Site Catchment Description

The Seriti Power project area is situated within the Olifants Water Management Area 4 (WMA 4), falling within quaternary catchments B20G, B11F, and B20F. The majority of the project area, including its infrastructure, lies within the B20G quaternary catchment. This area is part of the greater Wilge River Catchment, which precedes the Loskop Dam Catchment downstream.

Additionally, the southwestern segment of the site falls within the B11F catchment, intersected by the Olifants River, while a smaller section in the northeast falls within the B11G catchment. Both B11F and B11G quaternary catchments are classified as Largely Modified by the Department of Water and Sanitation (DWS). For visual reference, Figure 5-2 illustrates the quaternary catchments.

The Surface Water Impact Assessment confirms that surface water drainage within the identified quaternary catchments is characterised by predominantly ephemeral to intermittent drainage lines and unnamed tributaries that respond to seasonal rainfall patterns. No new permanent surface water diversions or instream works are proposed as part of the underground mining activities. Potential interactions with surface water resources are indirect and are managed through stormwater control measures and clean and dirty water separation as detailed in the Storm Water Management Plan. Wetland systems associated with the drainage network are addressed through subsurface interaction considerations rather than direct surface disturbance.

### 5.2.2 Water Management Area

The Seriti Power project area is situated within the Olifants Water Management Area 4 (WMA 4), The Olifants Water Management Area 4 (WMA 4), comprises several significant rivers, including the Elands River, Wilge River, Steelpoort River, and Olifants River. Additionally, it covers various dams, including the Blyderivierpoort Dam on the Blyde River and the Bronkhorstspuit Dam on the Bronkhorstspuit River. Drainage patterns are influenced by factors such as topography, land use, and human activities.

### 5.2.3 Quaternary Catchments Characteristics

The attributes of the affected quaternary catchments, namely the Mean Annual Runoff (MAR), Mean Annual Precipitation (MAP) and Mean Annual Evaporation (MAE) are summarised in Table 5-3. Quaternary catchments B11F, B20G and B20F indicate that the percentage of MAP that contributes to MAR in the catchments are 6.7% and 6.6% respectively.

**Table 5-3: Predominant Quaternary Catchments for KPSX**

Quaternary Catchment	Catchment Area (km <sup>2</sup> )	Rainfall Zone	MAP (mm)	MAR (mm)	MAR m <sup>3</sup> x 10 <sup>6</sup>	Evaporation Zone	MAE (mm)
B11F	338	B1A	692	46.4	15.69	4A	1599
B20G	519.4	B2C	669	44	22.87	4A	1689
B20F	497.2	B2B	661	33.7	16.74	4A	1677

The majority of the project area which is 64.9 km<sup>2</sup> falls within quaternary catchment B20G, constituting 12.5% of the quaternary catchment and 0.5% of the Loskop Dam catchment. The MAR for the Loskop Dam is 397 million m<sup>3</sup>. The project area occupies 8.63

km<sup>2</sup> of quaternary catchment B11F, constituting 2.55% of the catchment. The MAR from KPSX is estimated to contribute 0.26% to the Witbank Dam whilst the MAP that ends up as MAR in catchments B20F is 5%.

## 5.2.4 Drainage Systems

The KPSX area is drained by multiple streams situated in the upper regions of the Olifants River system. Detailed information regarding the associated drainage networks in the two quaternary catchments where the project is situated is provided in Table 5-4.

**Table 5-4: Predominant Quaternary Catchment Characteristics for KPSX**


Quaternary Catchment	Water Resources/ River Systems
B11F	<ul style="list-style-type: none"> <li>☛ The portion of project site is drained in a westerly direction by the upper sections of the Tweefonteinspruit;</li> <li>☛ A perennial pan is located on the catchment divide; and</li> <li>☛ Several farms' dams are located on the upper Tweefonteinspruit.</li> </ul>
B20G	<ul style="list-style-type: none"> <li>☛ The site is drained by two stream systems, namely the Saalklapspruit and Grootspruit in a northerly direction to join the Wilge River;</li> <li>☛ The Grootspruit is characterised by several floodplains, wetlands and several farm dams; and</li> <li>☛ There are several unnamed tributaries of these main streams that also drain the project site.</li> </ul>
B20F	<ul style="list-style-type: none"> <li>☛ The B20F catchment (in the project area) is drained by an un- named tributary that drains into the Wilge River approximately 15 km to the northwest.</li> </ul>

## 5.3 Geology

### 5.3.1 Regional Geology


Regional geology of the area comprises of the sedimentary deposits of the Karoo Supergroup. The supergroup is famous due to the occurrence of the coal deposits in South Africa, its terrestrial vertebrates' fossils, distinctive plant assemblages, thick glacial deposits, and extensive dolerite dykes and sills (Johnson et al., 2006). The deposit is associated with the series of the Gondwana Basin developed as a result of subduction, compression, collision, and terrane accretion along the southern margin of Gondwana. In the world, other deposit of similar age are found in South America, Falkland Island, Madagascar, India, and Australia (Figure 5-5). Figure 5-6 shows the location of the Karoo Supergroup in South Africa and adjacent territories. Apart from South Africa, the deposit is also found in Namibia, Lesotho, Botswana, Zimbabwe, and Mozambique. The deposit has been subdivided into the Main Karoo, Tuli, Springbok Flats, Tshipise, and Elliras Basin (Johnson et al., 2006). KPS mining operations are located within the Main Karoo Basin. The Main Karoo Basin is approximately 700 000 km<sup>2</sup> in area extent. The basin comprises of several sedimentary deposit divided into:


- ☛ Dwyka group
- ☛ Beaufort group
- ☛ Ecca group
- ☛ Molteno, Elliot and Clerens Formation


 Drakensburg Group

The basin also comprises of the Drakensburg Group which is characterised by basaltic lava. Figure 5-6 shows the surface geological outcrop of the KPS mining area. The following geology forms part of the surface outcrop in the area:

 Dwyka Group

 Karoo Dolerite

 Vryheid Formation

 Quaternary deposit

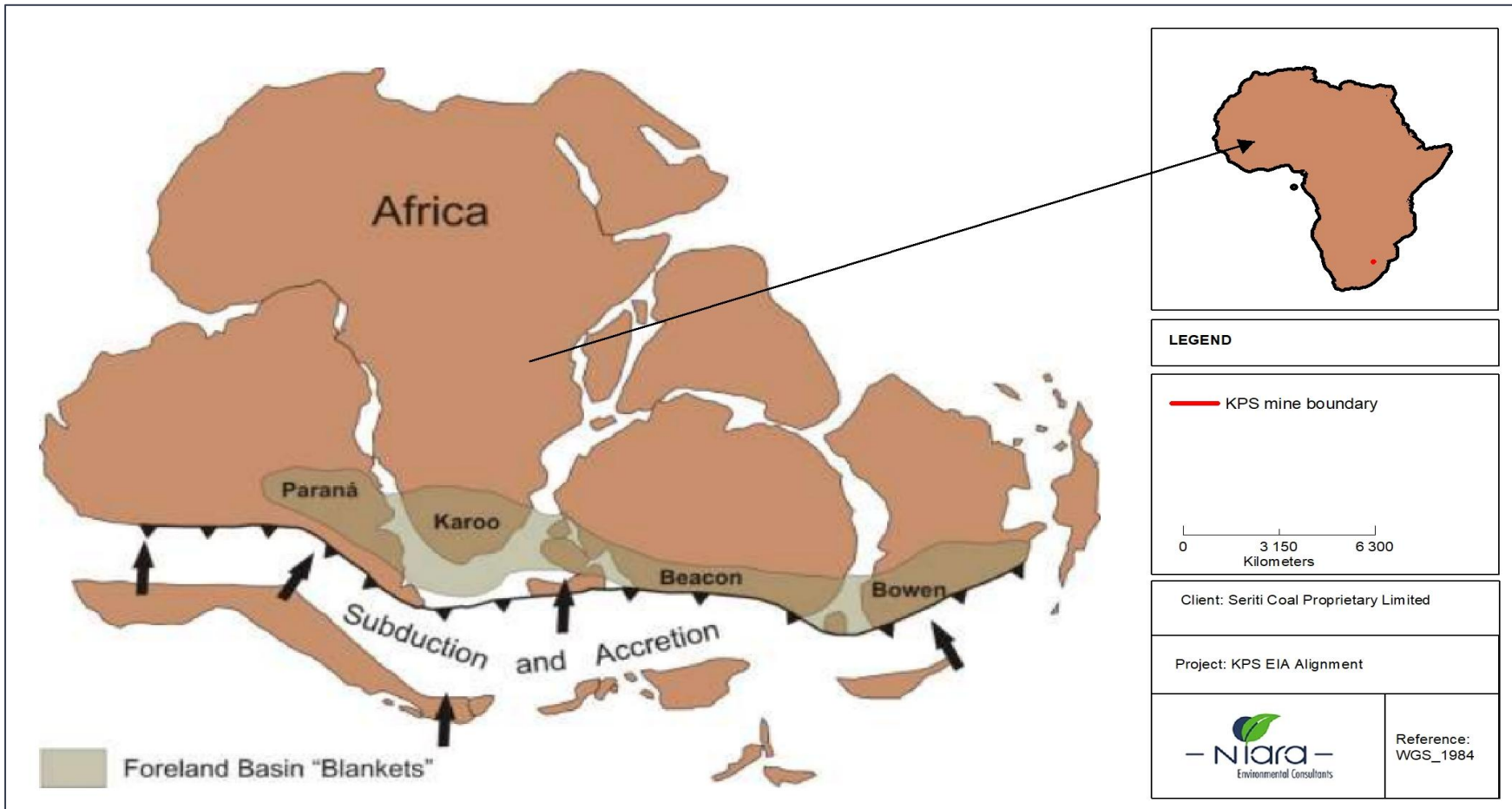


Figure 5-5: Position of the Karoo Basin in relation to the other Karoo aged depocentres of south-western Gondwana (Modified from: Hancox and Götz, 2014; de Wit and Ransome, 1992).

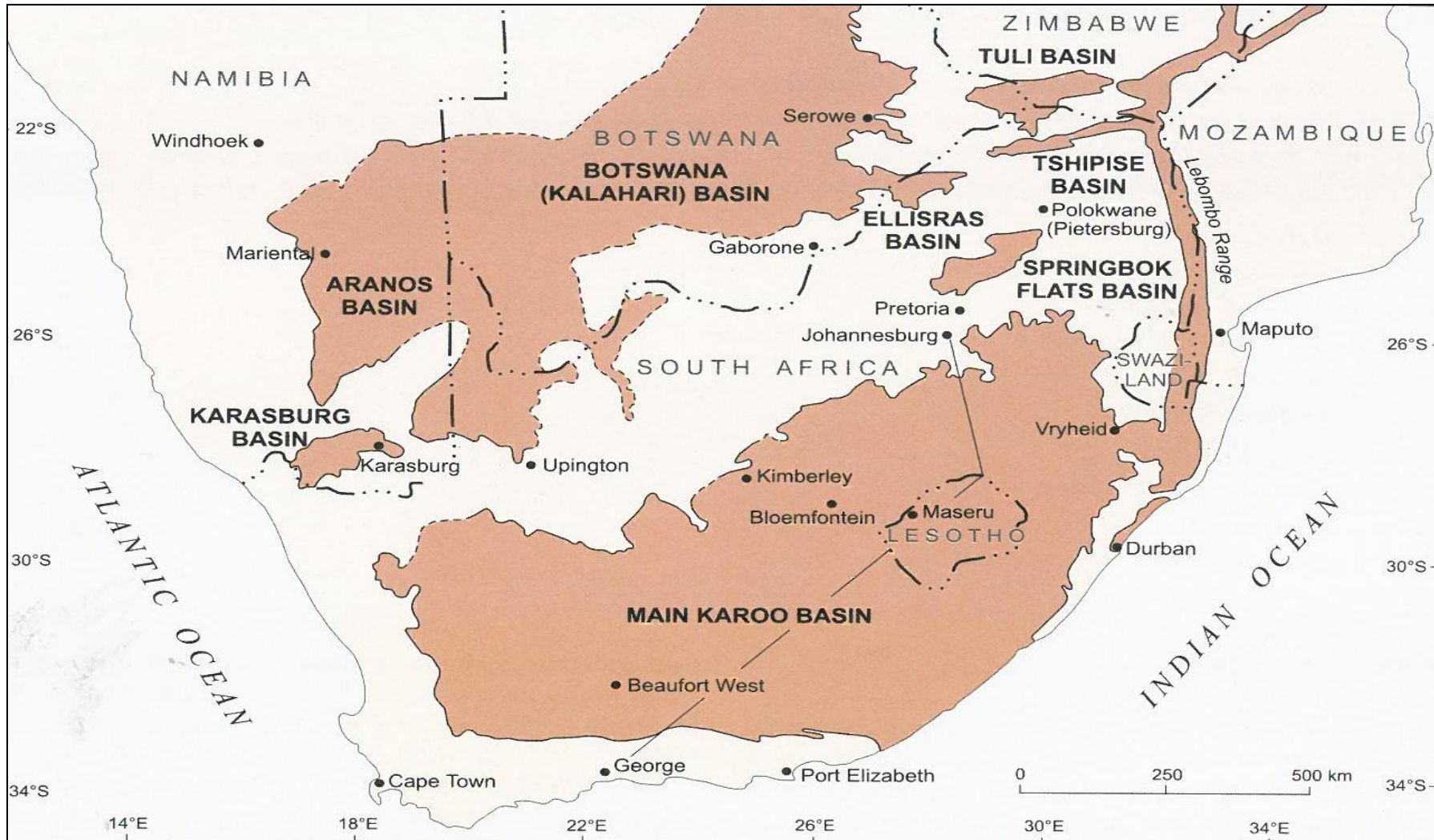


Figure 5-6: Location of the Karoo Basins in South Africa and adjacent territories (Johnson et al., 2006).

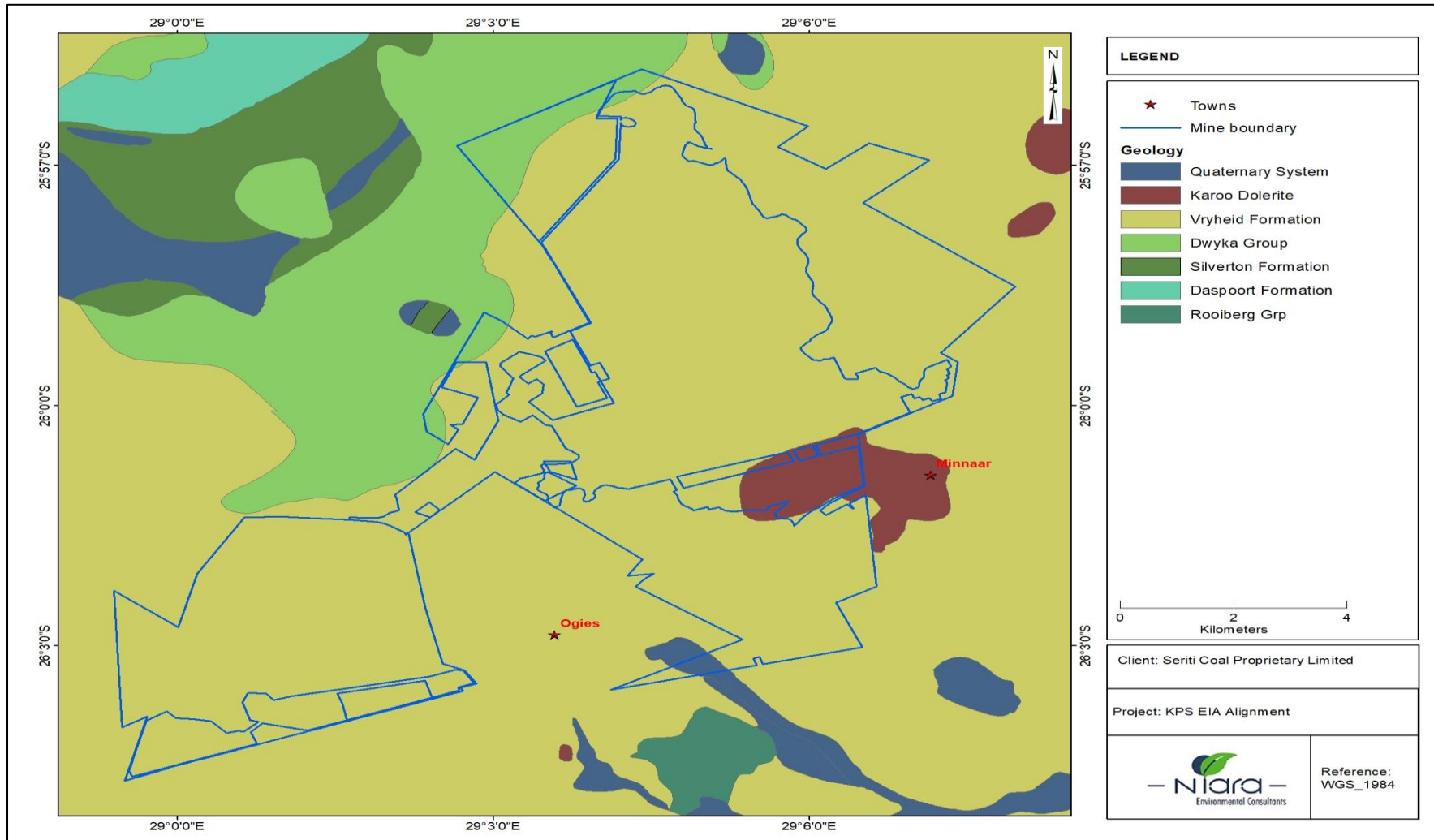


Figure 5-7: Surface geological outcrop within KPS.

### 5.3.2 Site Specific Geology

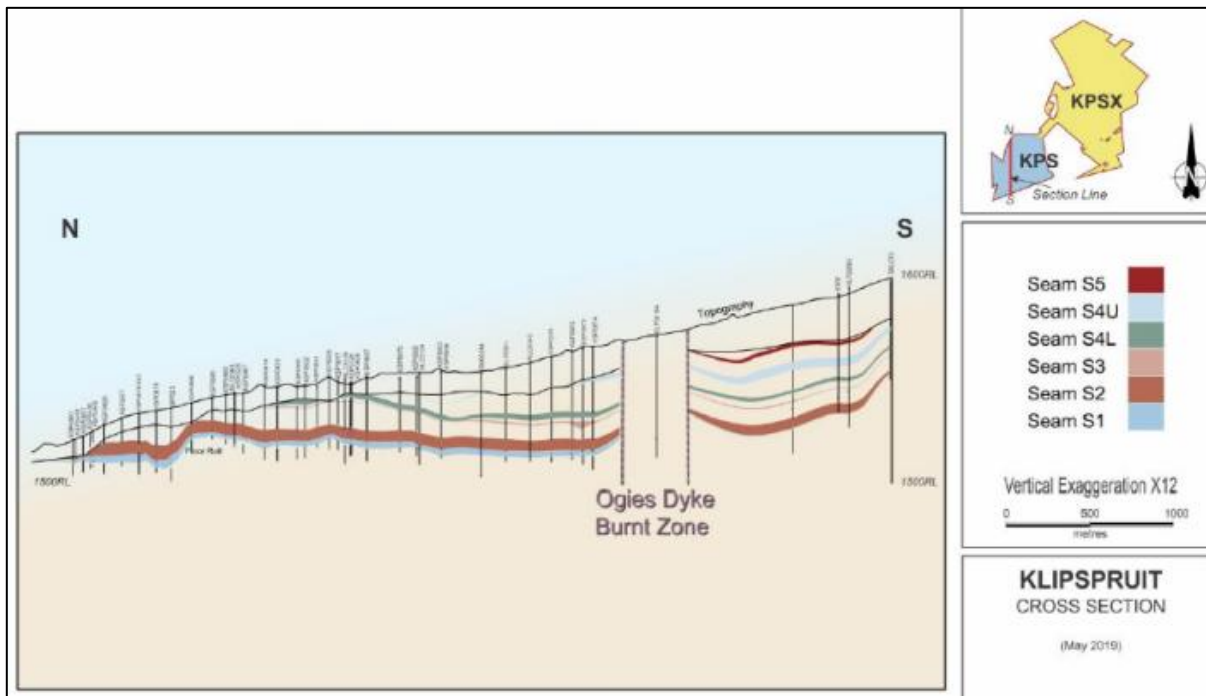
KPS is underlain by the Vryheid Formation of the Ecca Group, Dolerite intrusion, Dwyka Group and quaternary cover. According to South32 (2019), the surface topography of the coal resource area is characterised by flat to undulating topography with average elevation of 1 550 mamsl. The occurrence of soil, sand, laterite, and clay was noted mainly above the solid sediment. This unconsolidated material varies in thickness from 10 – 12 m depending on the depth of weathering (South32, 2019).

The geological log recorded during exploration comprises of the following (SRK, 2009):

- ✔ Soft overburden
- ✔ Hard overburden
- ✔ No.5 coal seam
- ✔ Inter burden
- ✔ No.4U coal seam
- ✔ Inter burden
- ✔ No.4L coal seam
- ✔ Inter burden
- ✔ No.3 coal seam
- ✔ Inter burden
- ✔ No.2 coal seam
- ✔ Inter burden
- ✔ No.1 coal seam

No 1 coal seam occurs above the basement deposit consisting of diamictite rock of glacial origin. The topography of the coal seam has been controlled by pre-Karoo topography that played a significant role in the distribution of coal seam No 3, 4, and 5. Exploration records suggest that No 4L coal seam is discontinuous within the mine, with No 2 coal seam being continuous (SRK, 2019).

In the KPS Main pit, exploration drilling suggests the existence of six coal seam that include 5 seam, 4-Upper seam, 4- Lower seam, 3 seam (not economic), 2 seam and the 1 seam. Mapping within the section suggest that the topography slopes towards the norths. Further analysis suggests that in area with flat lying coal seam, such areas the coal was affected by weathering. In the area north of the Ogies Dykes, limited extent of the No 5 coal seam was recorded which confirmed the effects of weathering in this region (South32, 2019). In the southern portion of KPS, No 5 coal seam has well developed. Figure 5-8 shows a North – South cross section of the Klipspruit mining area.



**Figure 5-8: North-South cross section through Klipspruit Mining Right Area (South32, 2019).**

Figure 5-9 shows the general stratigraphy for Klipspruit South area. Geological deposit of the Klipspruit area is that of the Witbank coalfield, and comprises of the white, fine to coarse grained sandstone layer, shale and siltstones. The following provide a summary of the geological log:

- 🌿 The top layer is composed of soil.
- 🌿 The topsoil is underlain by the fine to coarse grained sandstones
- 🌿 No 5 coal seam occurs below the sandstone, between the depth of 10 – 15 m below ground level.
- 🌿 In some areas such as Main Pit Ramp 4, No 5 seam was not found. In this region, a shale was found below the sandstone, followed by No 4 Upper seam, with a shale below the No 4 Upper seam.
- 🌿 An alternating shale, sandstone, and No 4 Upper and Lower seam was found between the depth of 15 – 40 m below ground.
- 🌿 No 2 seam occurs between the depth of 40 – 55 m below ground, with Dwyka Group occurring at the bottom.

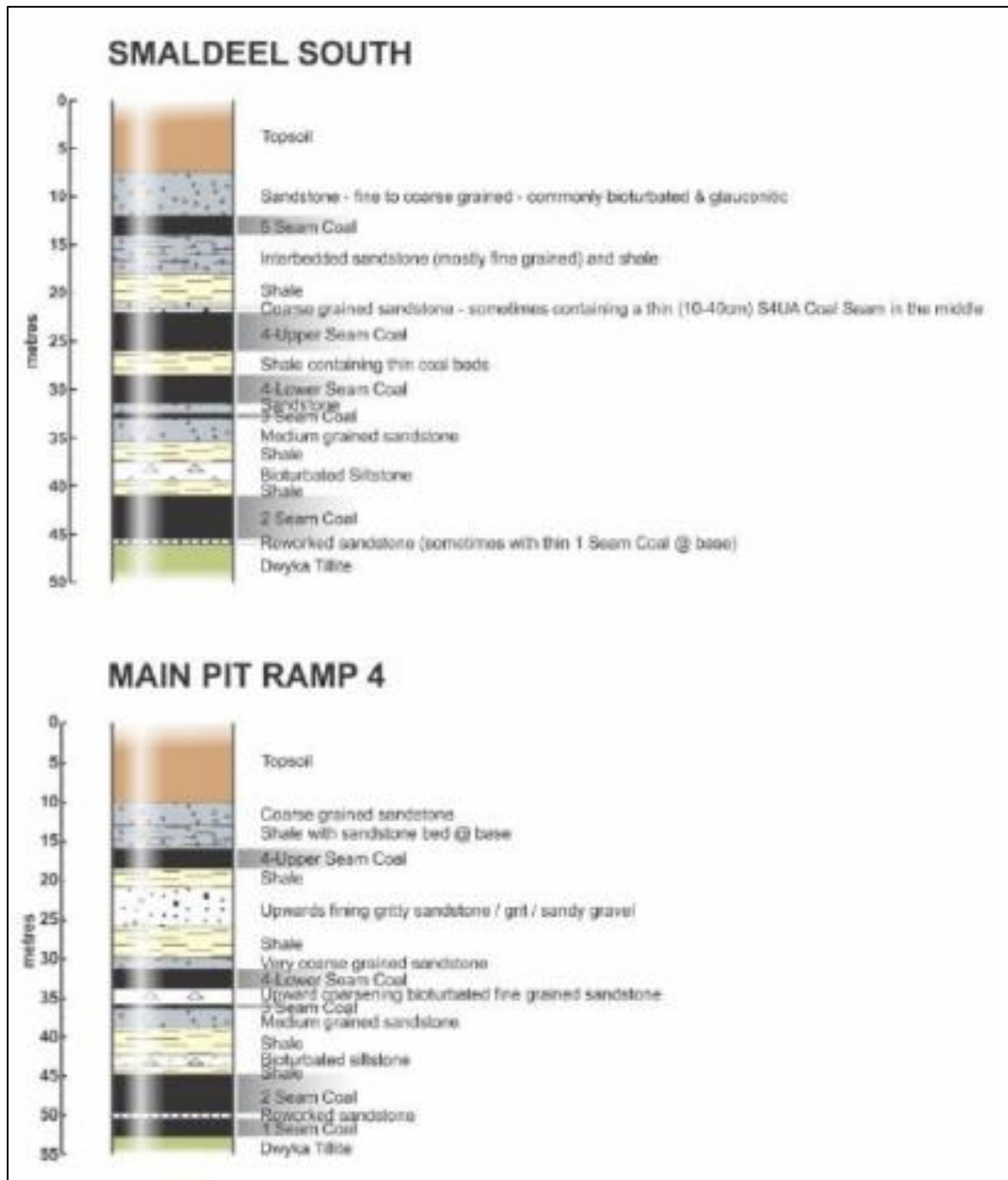
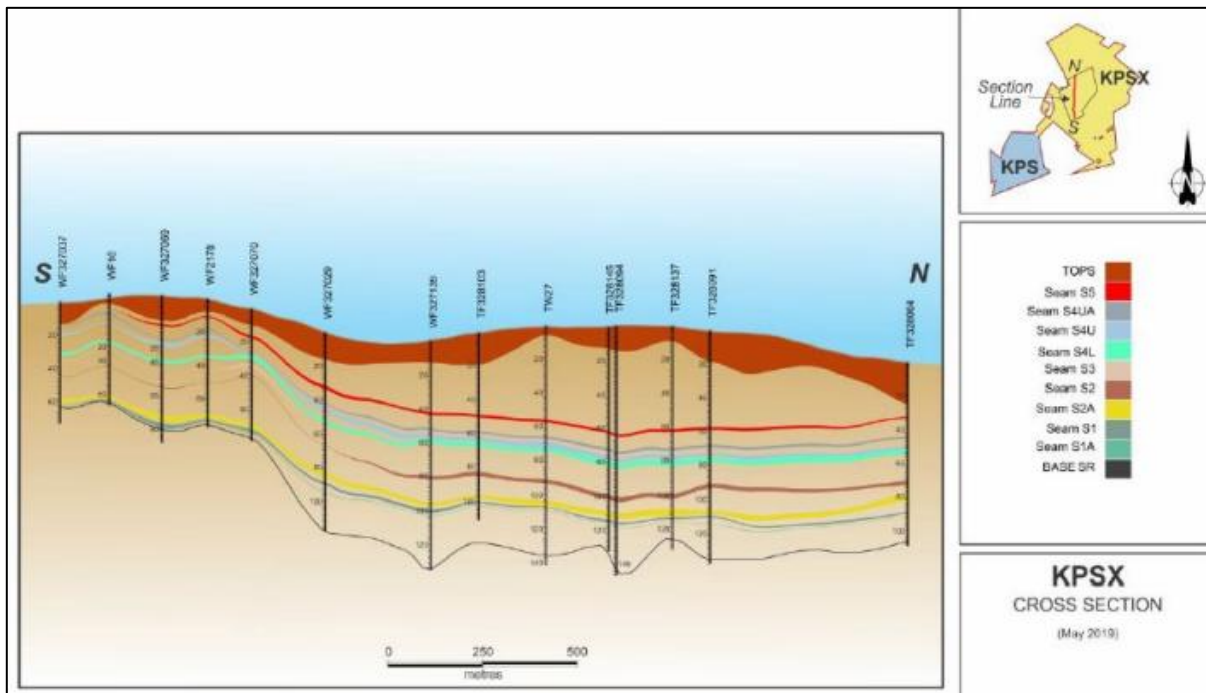


Figure 5-9: General Stratigraphic Column - Klipspruit South (South32, 2019).

Lithological sequence of the KPSX is shown in Figure 5-10. The following was observed in the KPSX mining area:

- 🌿 The stratigraphy of the KPSX has some features similar to that of the KPS Main Pit.
- 🌿 The No 5 seam is different from the KPS Main pit in terms of the quality.
- 🌿 No 4 Upper seam is well developed at KPSX than KPS south.
- 🌿 No 2A seam was mapped at KPSX



**Figure 5-10: North-South cross section - KPSX area (South32, 2019).**

According to SRK (2009), the underground mine section comprises of the No 2 and 4 seam which are well developed with a parting thickness of 12 m. The coal is interbedded with material composed of sandstones and mudstones. Table 5-5, Table 5-6, and to Table 5-7 shows the geology of the underground mine section. Overburden soil varies from 0.42 – 11.55 m with an average of 6.27 m. Zone of weathering varies from 11.27 – 34.51 m with an average of 20.31 m. Maximum overburden from surface to No 5, 4L, 2, and 1 is 35.4 m, 54.8 m, 66.73 m, and 69,28 m respectively. Average coal thickness is about 1.86 m, 3.97 m, 1.51 m, and 3.92 m for No5, No 4U, No 4L and No 2-coal seam respectively. Table 5-7 provides a statistical summary of the exploration.

**Table 5-5: Limit of weathering and total overburden depths for the proposed underground section (SRK, 2019).**

Description	Minimum	Maximum	Average
Soft soil overburden thickness (m)	0.42	11.55	6.27
Weathering Thickness (m) (This is for the total study area)	11.27	34.51	20.31
Total Overburden from surface to the No.5 coal seam – where present (m)	18.3	35.4	25.7
Total Overburden from surface to the No.4L coal seam (m)	13.56	54.8	38.95
Total Overburden from surface to the No.2 coal seam (m)	16	66.73	50.79
Total Overburden from surface to the No.1 coal seam (m)	61.1	69.28	64.93

**Table 5-6: Thickness of the main coal seams for the proposed underground section (SRK, 2019).**

Coal seam number	Average (m)
No.5 coal seam	1.86
No.4U coal seam	3.97

Coal seam number	Average (m)
No.4L coal seam	1.51
No.2 coal seam	3.92

**Table 5-7: Stratigraphic composition for the different lithological units above the No.1 coal seam, for the underground section (SRK, 2019).**

Description	Count	Min (m)	Max (m)	Ave (m)	%	Weighted (%)
Overburden	27	0.42	11.55	6.27	28	18.66
Sandy gravel	3	0.07	0.12	0.09	0.4	0.03
Sandstone (Gritty)	51	0.04	12.11	1.52	6.79	8.54
Sandstone (Muddy)	19	0.04	2.77	0.8	3.57	1.68
Sandstone (Coarse)	19	0.07	3.66	0.99	4.42	2.07
Sandstone (Medium grained)	29	0.04	3.8	1.51	6.74	4.83
Sandstone (Fine)	118	0.03	6.23	1.02	4.56	13.26
Mudstone	62	0.01	5	1.69	7.55	11.55
Mudstone (Pebbly)	7	0.08	2.11	0.63	2.81	0.49
Mudstone (Sandy)	36	0.08	5.45	1.26	5.63	5
Fines	63	0.06	2.71	0.95	4.24	6.6
Shale	1	0.14	0.14	0.14	0.63	0.02
Coal (Other)	79	0.03	8.03	2.78	12.42	24.2
Diamictite	18	0.12	1.59	0.8	3.57	1.59
Rest	7	1.2	4.86	1.94	8.66	1.5
<b>Total</b>	<b>539</b>			<b>22.39</b>	<b>100</b>	<b>100</b>

The geology of the strip mining is summarised in Table 5-5, Table 5-6, and Table 5-7. The following section provides a brief description.

#### Weathering and total overburden depths:

- ☛ General stratigraphy of the strip-mining area is composed of overburden ranging from a minimum of 4.8 – 19.15 m with an average of 10.09 m.
- ☛ The weathering thickness ranges from 11.27 m – 34.51 m, with an average of 20.31 m.
- ☛ Maximum thickness above the No 5, 4L, 2 and 1 is about 29.23 m, 43.55 m, 57.04 m, and 56.67 m respectively.

#### Thickness of the main coal seams for the area north of the Ogies Dyke:

- ☛ Average thickness of No.5 coal seam ranges from 1.56 m to 6.05 m. The thickness is about 1.56 m for No 5 coal seam, 2.5 m for No 4U coal seam, 2.65 m for No 4L coal seam, and 6.05 m for No 2 coal seam.

#### General stratigraphy of the area is composed of the following rocks and soil:

- ☛ Overburden
- ☛ Sandy gravel
- ☛ Grit
- ☛ Sandstone (Gritty)
- ☛ Sandstone (Muddy)
- ☛ Sandstone (Coarse grained)

- ✔ Sandstone (Medium grained)
- ✔ Sandstone (Fine grained)
- ✔ Mudstone
- ✔ Mudstone (Pebbly)
- ✔ Mudstone (Sandy)
- ✔ Fines
- ✔ Shale (Carbonaceous)
- ✔ Coal (Other)
- ✔ Dolerite

**Table 5-8: Limit of weathering and total overburden depths for the proposed strip mine section (SRK, 2019).**

Description	Minimum	Maximum	Average
Soft soil overburden thickness (m)	4.8	19.15	10.09
Weathering Thickness (m) (This is for the total study area)	11.27	34.51	20.31
Total Overburden from surface to the No.5 coal seam – where present (m)	7.16	29.23	15.48
Total Overburden from surface to the No.4L coal seam (m)	5.1	43.55	17.33
Total Overburden from surface to the No.2 coal seam (m)	14.24	57.04	24.72
Total Overburden from surface to the No.1 coal seam (m)	18.11	56.67	31.8

**Table 5-9: Thickness of the main coal seams for the area north of the Ogies Dyke (SRK, 2019).**

Coal seam number	Average (m)
No.5 coal seam	1.56
No.4U coal seam	2.5
No.4L coal seam	2.65
No.2 coal seam	6.05

**Table 5-10: Stratigraphic composition for the different lithological units above the No.1 coal seam, for the strip mine section (SRK, 2019).**

Description	Count	Min (m)	Max (m)	Ave (m)	%	Weighted (%)
Overburden	29	4.8	19.15	10.09	29.83	17.74
Sandy gravel	1	0.52	0.12	0.52	1.54	0.03
Grit	4	0.03	3.83	2	5.91	0.48
Sandstone (Gritty)	18	0.03	3.72	1.18	3.49	1.29
Sandstone (Muddy)	79	0.08	9.73	2.01	5.94	9.63
Sandstone (Coarse grained)	53	0.06	11.9	1.59	4.7	5.11
Sandstone (Medium grained)	77	0.04	11.46	1.9	5.62	8.87
Sandstone (Fine grained)	102	0.05	17.52	2.68	7.92	16.57
Mudstone	83	0.03	7.2	1.86	5.5	9.36
Mudstone (Pebbly)	7	0.04	0.78	0.37	1.09	0.16
Mudstone (Sandy)	82	0.03	13.05	2.3	6.8	11.43
Fines	62	0.08	18.25	1.44	4.26	5.41
Shale (Carbonaceous)	1	0.25	0.25	0.25	0.74	0.02
Coal (Other)	122	0.03	8.27	1.75	5.17	12.94
Dolerite	2	1.8	3.6	2.7	7.98	0.33
Rest	9	0.04	2.4	1.18	3.49	0.64

Description	Count	Min (m)	Max (m)	Ave (m)	%	Weighted (%)
Total	731			33.82	99.98	100.01

## 5.4 Acid generation capacity

### 5.4.1 Acid-Base Accounting

ABA is the most used technique for predicting the water quality likely to result from a mining operation (Smith & Brady, 1990). It is also a cost-effective means of predicting acid rock drainage (ARD) potential. Acid-base accounting illustrates the ultimate acidity or basicity of different rock zones in the overburden (Skousen et al., 1971). According to Price (2010), ABA is a series of compositional analyses and calculations which entail the:

- Analysis of pH.
- Analysis of sulphur species and calculation of the Acid Potential (AP).
- Analysis of Neutralization Potential (NP).
- Calculation of NP/AP (Neutralization Potential Ratio, NPR) and NP-AP (Net Neutralization Potential, NNP).

### 5.4.2 Net Acid Generation

NAG is one of the static test methods used for geochemical assessment. The method assists in assessing and predicting the potential of the rock to generate acid during mining and after closure. The method can be used separately to characterise the acid generation potential of the rock or waste. However, it can also be used to predict acid generation potential as a supplementary method to ABA.

### 5.4.3 Sulphur Speciation

Sulphur speciation is one of the critical components of acid mine drainage formation. The presence of sulphur in waste material has major environmental risk and impact. One of the common impacts is the potential to generate acid mine drainage. The parameters have been analysed to support the ABA and NAG method.

### 5.4.4 Geochemical assessment and classification

#### 5.4.4.1 SRK, 2009: Klipspruit Colliery Revised and Consolidated EIA and EMP

#### Sampling location and description

The lithological profile was considered in collecting samples for analysis of geochemistry. Samples were collected in three boreholes drilled and four samples were collected during exploration boreholes. These samples were critical in understanding the geochemical signature of the stratigraphic unit above No 1 coal seam. In total, 20 samples were collected and subjected to Modified Sobek (Lawrence) Method in order to determine the ABA and leach test analysis.

The composition of the samples collected is as follows:

- Soft overburden (soils and clays, weathered shale, mudstone, and sandstone);

- Hard overburden (unweathered sandstone, mudstone and shale);
- No.'s 5, 4, 3, 2 and 1 coal seams (some not totally developed); and
- Interburden (sandstone units, mudstone and shale (some carbonaceous)).
- The geochemical characterisation is concentrated on the overburden and the coal seams.

#### Acid Base Accounting Results:

- Of the total of twenty samples, three samples had a paste pH of less than 7.20, which suggest that majority of the samples will have excess base material present in the geology of the site. Mine water drainage in this lithology will be characterised by elevated alkalinity.
- Total S% in all lithology varies from 0.001% - 0.846% with an average of 0.144%. In these areas, pyrites mineralisation distribution in lithology was heterogeneity.
- The value of Acid Generation Potential (AP) varied from 0.03 kg/t CaCO<sub>3</sub> to 26.4kg/t CaCO<sub>3</sub>, with an average of 4.5 kg/t CaCO<sub>3</sub>. Six samples are characterised by elevated AP value.
- Neutralization Potential (NP) value ranges from 0 kg/t CaCO<sub>3</sub> to 15.5 kg/t CaCO<sub>3</sub> with an average of 4 kg/t CaCO<sub>3</sub>. All samples comprise of an average lower than the AP value.
- The Nett Neutralization Potential (NNP) was measured between -13.6 kg/t CaCO<sub>3</sub> and 15.1 kg/t CaCO<sub>3</sub>. While the negative value suggests the presence of acid potential samples, some samples comprise of positive value suggesting the presence of neutralisation potential samples.
- The rock types assessment results suggest that six samples are Type I which represent potential acid forming, while three and eleven samples are intermediate and non-acid forming samples.

#### Geochemical strata:

Geochemical strata were separated and sampled according to lithological types and soil. The following was identified and sampled according to the type of material:

- Soil profile with clay layer underneath
- Gray-pinkish, fine weathered sandstone
- Gray-white, fine massive sandstone and grayish shale; and
- No.4 and No.2 coal seams and highly carbonaceous shale

#### Summary of findings, Geochemical strata:

##### *Soil profile with clay layer:*

- ✔ Average value for %S is about 0.001. This value suggest that the sample is AP.
- ✔ The value of NP is present at higher value above the value of AP.
- ✔ Average NNP value is positive which suggest excess neutralisation potential.

***Fine grained weathered sandstone:***

- ✔ The value of %S varies from 0.001 to 0.133, with an average of 0.045. This suggest that the sample is AP.
- ✔ Overall NNP average value is positive which shows excess neutralisation potential.

***Fine grained fresh sandstone and shale:***

- ✔ The unit is characterised by shale and sandstone where shale comprises of higher %S value than sandstone.
- ✔ The value of %S was less than 0.137%, with exploration boreholes samples containing higher %S.
- ✔ The NNP value also suggest an excess neutralisation potential due to positive values.

***No's. 2 and 4 Coal seam & highly carbonaceous shale***

- ✔ The coal seam is characterised by higher %S in terms of average values. The samples comprise of AP which is higher than NP values.
- ✔ The coal seam and carbonaceous shale are classified as having potential to form acid. The shale will form acid in a medium to long term basis.

**Table 5-11: Summary of the in-situ geochemical characteristics of the overburden and coal seams at Klipspruit (SRK, 2009).**

Geochemical unit and boreholes sampled		Total % S	AP (kg/t)	NP (kg/t)	NNP (kg/t)	Ratio NP: AP
Soil profile with clay layer	Min	0.001	0.031	0	-0.031	0
	Max	0.001	0.031	0.75	0.719	24
	Ave	0.001	0.031	0.25	0.219	8
Fine grained, weathered sandstone	Min	0.001	0.031	0	-0.031	0
	Max	0.133	4.156	10.25	6.094	72
	Ave	0.045	1.406	4.167	2.76	24.822
Fine grained fresh sandstone and shale	Min	0.005	0.156	0.5	-6.406	0.117
	Max	0.357	11.156	12	11.844	76.8
	Ave	0.166	5.198	5.75	0.552	25.781
No. 4 coal seam and carbonaceous shale	Min	0.273	8.531	0.5	-13.594	0.04
	Max	0.499	15.594	13.5	4.969	1.582
	Ave	0.391	12.229	5.333	-6.896	0.583
No. 2 coal seam	Min	0.846	26.438	14.25	-12.188	0.539
	Max	0.846	26.438	14.25	-12.188	0.539
	Ave	0.846	26.438	14.25	-12.188	0.539

#### 5.4.4.2 Groundwater Report

The data presented in Table 5-12 was used as a reference and sourced from an operation adjacent to Klipspruit Colliery. The results have showed similar results in terms of lithological units occurring within the area. The following provides a summary of the results:

- ✔ The maximum and average values for sandstone samples shows positive value in terms of NNP. This shows that the samples have excess neutralisation potential. The samples are also classified as Rock Type III in terms of its minimum, maximum, and average values, which confirm that the samples are non-acid generation.
- ✔ Minimum and average value for carbonaceous shale and siltstone are classified as acid forming according to Rock Type. NNP for both minimum and average are negative which support the conclusion that the samples are acid forming.
- ✔ No. 4 coal seam is classified as acid forming in terms of Rock Type I. The minimum, maximum, and average values for this coal seams are all classified as Rock Type I.
- ✔ Average value for No 2 coal seams according to Rock classified suggest a potential forming condition. Considering high AP value compared to NP value, and negative results of NNP value, the samples will most likely form acid which support the Rock Type.

**Table 5-12: Beesting EMPR geochemical summary (JMA, 2005; Digby Wells, 2015).**

Geochemical unit and boreholes sampled		Total % S	AP (kg/t)	NP (kg/t)	NNP (kg/t)	Ratio NP:AP	Rock Type
Sandstone (3 samples)	Min	0.01	0.22	1	-0.59	0.63	III
	Max	0.13	3.97	5	4.03	19.43	III
	Ave	0.06	1.93	3.42	1.49	7.11	III
Carbonaceous shale and siltstones (7 samples)	Min	0.16	4.88	0	-30.41	0	I
	Max	0.97	30.41	4.5	1.13	1.23	III
	Ave	0.39	12.02	2.07	-9.95	0.33	I
No. 4 coal seam	Min	0.39	12.03	0	-55.09	0	I
	Max	1.76	55.09	17	4.97	1.41	I
	Ave	1.06	32.96	6.55	-26.41	0.44	I
No. 2 coal seam	Ave	0.64	20.09	15	-5.094	0.75	I
No. 1 coal seam	Ave	0.39	12.03	17	4.969	1.41	II

#### 5.4.4.3 Klipspruit South Geochemical Assessment (Digby Wells, 2015).

##### Samples collected:

In total, fourteen samples were collected during drilling. These samples were collected at different depth based on lithology intersected during drilling. Table 5-13 shows the breakdown of samples collected during drilling.

**Table 5-13: Collected geochemical samples (Digby Wells, 2015).**

Boreholes	Samples	Description
BHPS01	Overburden Coal Seam 1	Composite of soil, mudstone and shale (carbonaceous)
	Coal Seam 1	Uppermost coal seam intersected
	Interburden Coal Seam 1&2	Sandstone and carbonaceous shale
	Coal Seam 2	Second intersected coal seam
	Interburden Coal Seam 2&3	Sandstone and carbonaceous shale
	Coal Seam 3	Third intersected coal seam
	Interburden Coal Seam 3&4	Sandstone and carbonaceous shale
	Coal Seam 4	Fourth intersected coal seam
BHPS02	Overburden Coal Seam 1	Composite of soil and sandstone
	Coal Seam 1	Uppermost coal seam intersected
	Interburden Coal Seam 1&2	Sandstone and carbonaceous shale
	Coal Seam 2	Second intersected coal seam
	Interburden Coal Seam 2&3	Sandstone and carbonaceous shale
	Coal Seam 3	Third intersected coal seam

**Laboratory and analysis:**

The samples were submitted to M & L Laboratory for determination of ABA parameters. The following were requested from the Laboratory:

- 🌿 Paste pH
- 🌿 %S
- 🌿 NNP
- 🌿 NAG
- 🌿 NPR

**Results and findings:**

Table 5-14 provides the results of the ABA.

**Total Sulphur, S %**

- 🌿 Three samples are classified as non-acid generation while eleven samples have potential to generate acid. These samples include; Overburden Coal Seam 1, Coal Seam 1, Interburden Coal Seam 1&2, Coal Seam 2, Coal Seam 3, Coal Seam 4, Coal Seam 1, Interburden Coal Seam 1&2, Coal Seam 2, Interburden Coal Seam 2&3, and Coal Seam 3.
- 🌿 Three samples comprise of %S of less than 0.3% and are therefore classified as not acid generation. These samples are: Interburden Coal Seam 2&3, Interburden Coal Seam 3&4, and Overburden Coal Seam 1.

**Paste pH**

- 🌿 All samples are classified as non-acid generation with the exception of Interburden Coal Seam 1&2 which have a paste pH of less than 5.5. This samples have a potential to generates acid.

### ***Net Neutralisation Potential (NNP)***

- Four samples namely Interburden Coal Seam 3&4, Overburden Coal Seam 1, Coal Seam 2, and Interburden Coal Seam 2&3 are classified as non-acid generation while two samples namely Overburden Coal Seam 1 and Interburden Coal Seam 1&2 are classified as acid forming material. The remaining samples are inconclusive.

### ***Neutralisation Potential Ratio (NPR)***

- Samples Overburden Coal Seam 1, Coal Seam 1, Coal Seam 3, and Coal Seam 4 are classified as having potential to generate acid while samples Coal Seam 2, Interburden Coal Seam 3&4, Overburden Coal Seam 1 and Interburden Coal Seam 2&3 are classified as non-acid formation. The remaining samples are inconclusive.

### ***Net Acid Generation (NAG)***

- Seven samples namely Overburden Coal Seam 1, Coal Seam 1, Coal Seam 2, Coal Seam 3, Coal Seam 4, Coal Seam 1, and Interburden Coal Seam 1&2 are classified as acid forming material with the remaining samples classified as non-acid generation.

### ***Classification***

Seven samples of the fourteen are classified as PAC while the remaining are classified as NON-AG.

Table 5-14: ABA and NAG Results.

Borehole	Sample ID	Total Sulphur, S %	Paste pH	AP	NP	NNP	NPR	NAG	Classification	Rock Type
	Overburden Coal Seam 1	1.48	5.6	46.2	12.1	-34.1	0.3	13.2	PAG	I
	Coal Seam 1	0.73	5.5	22.8	14.6	-8.2	0.6	1.53	PAG	I
	Interburden Coal Seam 1&2	0.96	7.6	30	38.3	8.3	1.3	<0.1	NON-AG	II
BHPS01	Coal Seam 2	0.67	7.9	20.9	32.3	11.4	3.7	6.91	PAG	II
	Interburden Coal Seam 2&3	0.2	7.7	6.24	12.7	6.46	2	<0.1	NON-AG	III
	Coal Seam 3	0.83	7.9	25.9	11.6	14.3	0.4	19.6	PAG	II
	Interburden Coal Seam 3&4	0.24	8.1	7.49	27.7	20.2	3.7	<0.1	NON-AG	II
BHPS02	Coal Seam 4	0.63	8.6	16.5	31	14.5	1.9	52.62	PAG	II
	Overburden Coal Seam 1	0.01	8.3	0.31	88	88	283.9	<0.1	NON-AG	III
	Coal Seam 1	1.21	8	37.8	47.8	10	1.3	3.3	PAG	II
	Interburden Coal Seam 1&2	4.91	5.3	153	24.3	-129	0.2	63.6	PAG	I
	Coal Seam 2	0.83	7.9	25.9	75.1	49.2	2.9	<0.1	NON-AG	II
	Interburden Coal Seam 2&3	0.38	8.4	11.9	44.2	32.3	3.7	<0.1	NON-AG	II
	Coal Seam 3	0.38	8.3	11.9	23.5	11.6	2	<0.1	NON-AG	II
	PAG	NON-AG								

## 5.5 Soils, Land Capability and Land Use

### 5.5.1 Land types and soil forms in the area

A land type survey on a scale of 1:250 000 was conducted in the early 1970s to compile inventories of the natural resources of South Africa in terms of soil, terrain, and climate. The land type indicates the dominant soil forms and their occurrence in terms of percentages. The land types that were found to be occupying the KPS and KPSX area are the Ba 4, Ba 5 and Bb 13 land types of the 2528 and 2628 Pretoria and East Rand Land Type maps (Land Type Survey Staff, 1989) as indicated in Figure 5-11. Land type Ba and Bb indicates land in which red and/or yellow brown apedal soils that are dystrophic and/or mesotrophic, dominate over red and/or yellow-brown eutrophic soils. Soils observed during the survey include Clovelly, Longlands, Hutton and Witbank soil forms as illustrated in Figure 5-12.

**The Clovelly soil form** is characterized by an A-horizon yellowish in colour, weak in structure without water stagnation, underlain by yellow-brown, structureless, sandy clay subsoil. The **Longlands soil form** consists of Orthic topsoil on an E horizon, over soft plinthic B subsoil. The E horizon is distinguishable by criteria, namely:

- ☛ Grey, pale yellow or white matrix colours;
- ☛ Being intermittently saturated with water;
- ☛ The depletion of iron oxides, clay, and organic matter;
- ☛ Being loose when wet and hardens and becomes brittle when dry.

The **Hutton soil form** consists of an orthic A and red apedal B over unspecified material. The Hutton soils and the Clovelly soils are well drained, usually slightly acidic, and have a low cation exchange capacity (CEC) due mainly to clay mineral composition (kaolinite, iron oxides) and sometimes low clay content. The **Witbank soil form** (Transported Technosols), which are materials intentionally transported by human intervention and already been impacted by mining activities (open cast areas and stockpiles). The properties of these soil forms are affected strongly by the nature of the material or the human activity that placed it and they are more likely to be contaminated than soils from other groups. The **Fernwood soil form** consists of Orthic A on an E horizon. Soils with an E horizon as representing 'Permanent or Seasonal Wetness'.

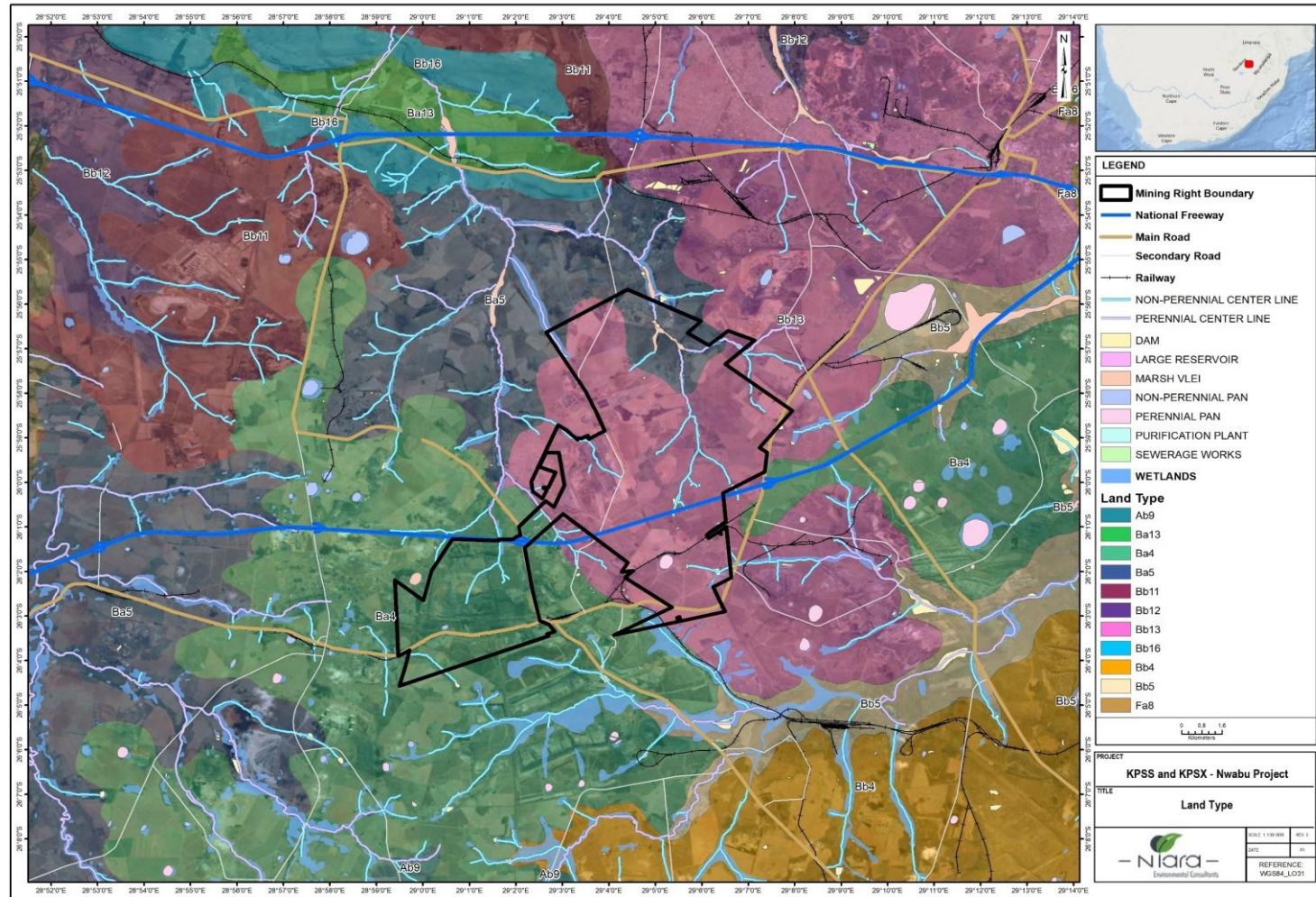


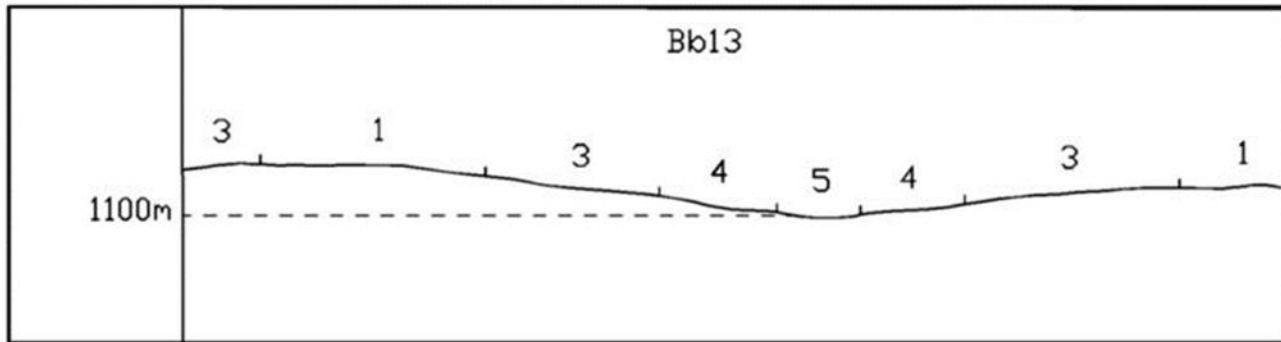
Figure 5-11: Land Types in the Vicinity of the Project Area



**Figure 5-12: Examples of the identified soil forms: A – C) Hutton (Red apedal), D) Clovelly, E) Longlands, F) Albic & G – H) Witbank (Transported Technosols).**

### 5.5.2 Dominant soil form in land type Bb13 and land type Ba5

The proposed underground mine area is located on Land Type Bb13 and Land Type Ba5. The area occupied by the Bb 13 land type is 40 316 ha. The Bb 13 land type is, is dominated by 40 % crest and 45 % midslope positions, the remainder (15 %) is occupied by valley bottom landscape positions see the representative terrain form sketch in below.



**Figure 5-13: Representative terrain form sketch of land type Bb 13**

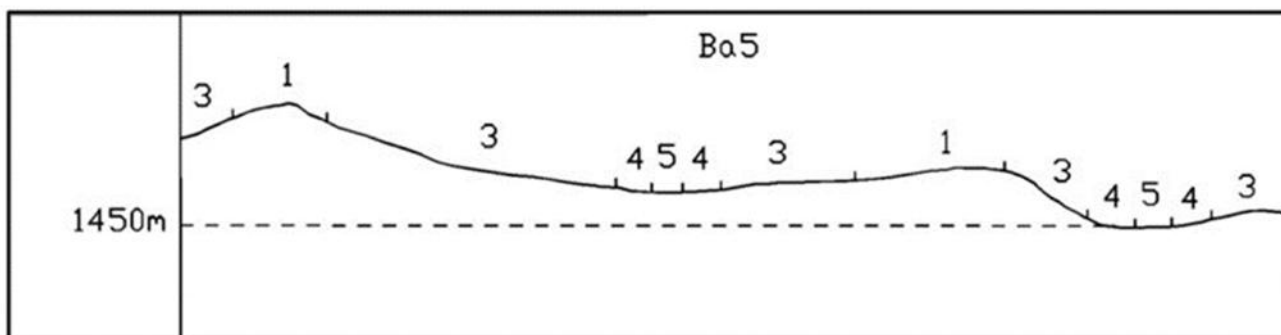
The Bb13 Land type is dominated by deep well drained yellow-brown apedal soils, with about 70% of the land type having these soils; they have an average slope of around 3%. The following list of soil types occurs within the crest (40%) in this land type:

- ☛ Clovelly (Cv) – 45%
- ☛ Avalon (Av) – 15%
- ☛ Other shallow soil types such as the Glencoe (Gc) soil – 40

The following list of soil types occurs within the midslope (45%) in this land type:

- ☛ Clovelly (Cv) – 35%
- ☛ Avalon (Av) – 35%
- ☛ Other shallow soil types such as the Glencoe (Gc) soil – 30%

The land area occupied by the Ba 5 Land Type is 77 663 ha. The Ba 5 Land Type is dominated by 20% crest and 60% mid-slope terrain unit positions in the landscape. Other positions in the landscape are foot-slope and valley bottom positions occupying 15% and 5% of the landscape positions respectively see the representative terrain sketch in Figure 5-14.



**Figure 5-14: Representative terrain form sketch of land type Ba5**

The Ba 5 Land type is dominated by deep well drained red/yellow-brown apedal soils, with about 60% of the land type having these soils; the average slope is estimated at 1.5 %. The following list of soil types occur within this land type in the crest (20%) of the landscape:

- ☛ Hutton (Hu) – 60%
- ☛ Clovelly (Cv) – 10%
- ☛ Shallow rocky soil – 30%

The following list of soil types occur within this land type in the midslope (60%) of the landscape:

- ☛ Hutton (Hu) – 40%
- ☛ Clovelly (Cv) – 10%
- ☛ Avalon (Av) – 10%
- ☛ Other shallow rocky soil – 40%

### 5.5.3 Soil types present within the KPSS and KPSX underground mining area

The major soil types found during field surveys are presented in Figure 5-15 below. The project site is dominated by the presence of high potential agricultural soils such as Hutton, Clovelly, Pinedene and Oakleaf soils which represent 60% of the project site. Furthermore, a high percentage of the project area consists of wetland soils.

### 5.5.4 Current land use, surrounding and historical

Results from the field soil survey (soil form and depth) and observations made on site, were used to inform the potential and realistic land uses for the area. The most dominant land uses within the project are mining activities (Coal) as illustrated in. The other land uses surrounding the site are crop production mainly maize and other coal mines. The main impact on land use will be the change to that of mining. The cumulative impact on land use will be converting into open cast mining and infrastructure areas resulting in loss of agricultural land in that area for the mining life and after mining land can be restored. Surrounding land use can be broadly defined as arable land under cultivation on commercial farms (Dryland and Pivot Irrigated).

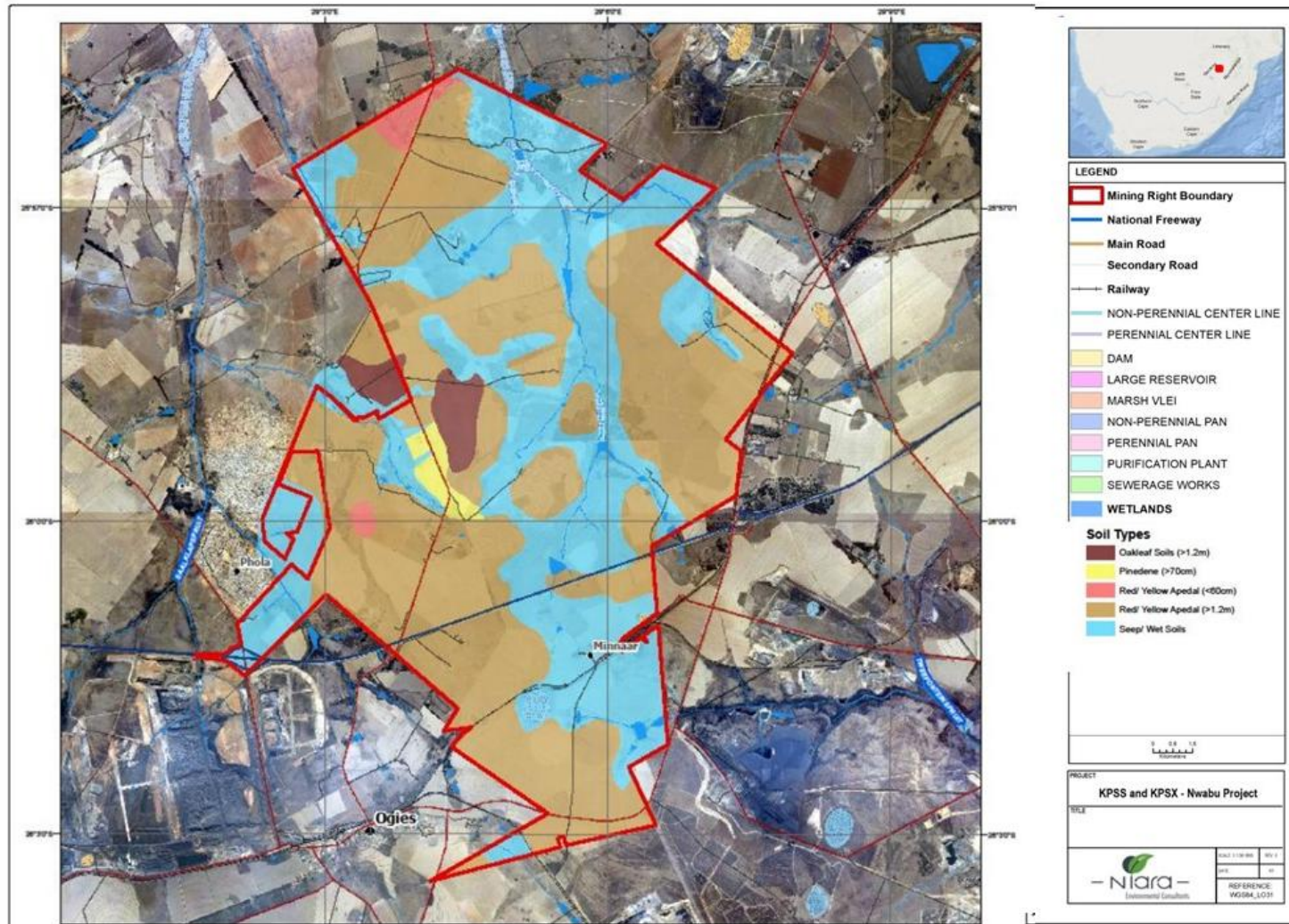


Figure 5-15: Major soil types found during the field survey in the KPS and KPSX underground mining area

### 5.5.5 Baseline soil quality

The fertility status of the KPSS and KPSX Underground mining area is annually adjusted through fertilisation to sustain commercial crop production. Natural soils (uncultivated) within the Ogies region is expected to contain 1 – 5 mg kg<sup>-1</sup> P in the topsoil. The high agricultural potential of the soil is proven through farmers records over the past 25 years of maize production. The estimated average yield over the 25-year period is 7 tons maize per ha on the farm. The Hutton soil occupying the higher landscape positions yields 10 tons of maize per ha, proving that the climate, soil and crop combination on this farm is ideal for maize production. Any cultivation of soils needs to take cognisance of the natural acidification process through monitoring and subsequent neutralisation of acidity through liming. No soil samples were recovered for laboratory analysis on this project due to the fact that no new mining infrastructure will be constructed as part of the project. An adit has already been developed to support the UG mining at KPSX together with the supporting UG conveyors. Only additional ventilation shafts and rescue boreholes will be constructed in strategic areas as the mining advances for both KPSX and KPSS. As such crop production can continue without disturbance.

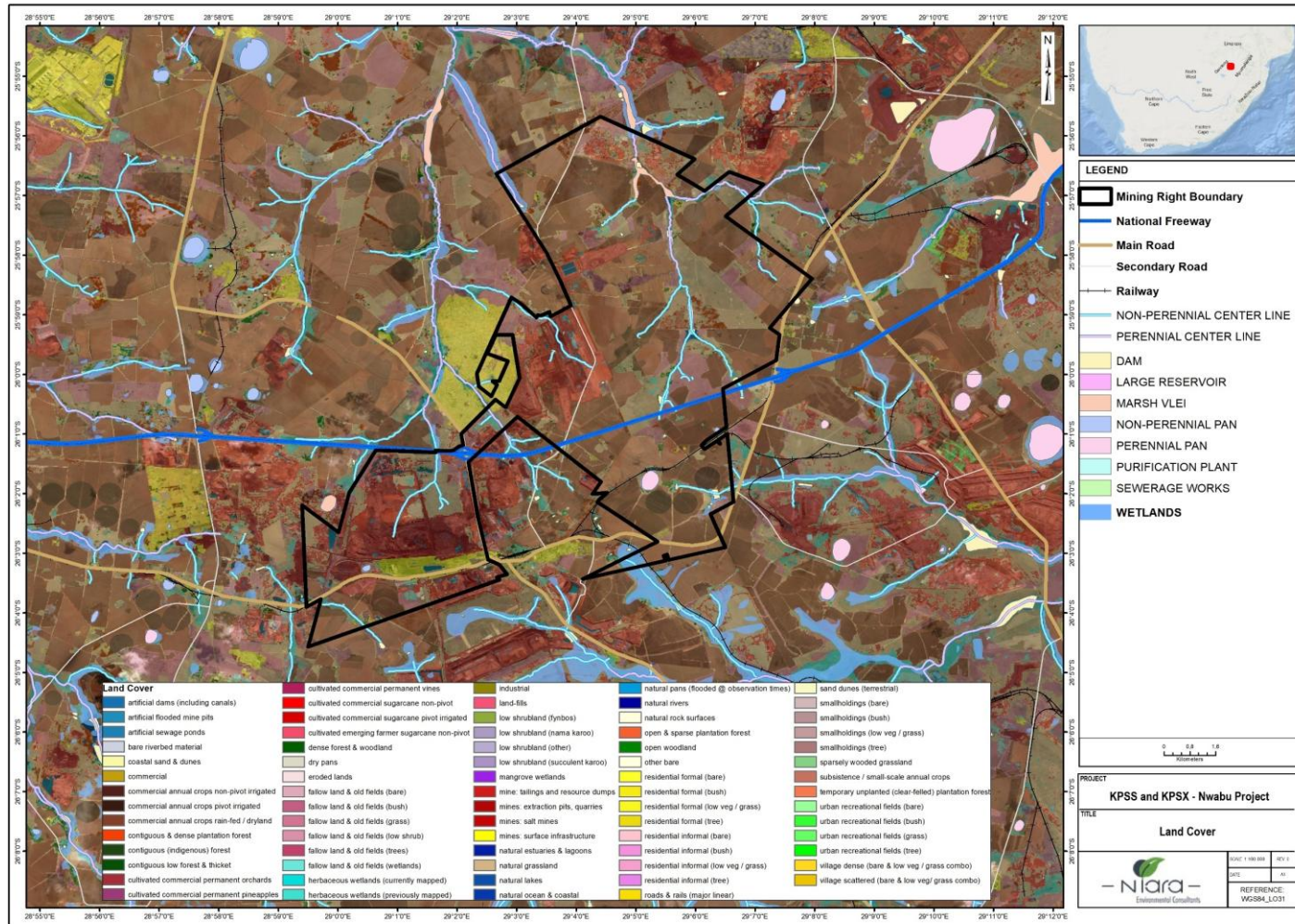


Figure 5-16: Land uses within the site and surrounding

### 5.5.5.1 Land capability

Land capability is determined by a combination of soil, terrain and climatic features. Land capability classification indicates sustainable long-term use of land under rain-fed conditions while soil properties implicating limitations associated with the various land use classes are also taken into consideration. The following paragraphs contain detailed listed limitations as used in the classification of Arable Class II and Grazing Class V (wetland) land capabilities of the KPS and KPSX underground mining area.

#### 5.5.5.1.1 Arable, Class II

Land in Class II has some limitations that reduce the choice of plants or require moderate conservation practices. It may be used for cultivated crops, but with less latitude in the choice of crops or management practices than Class I. The limitations are few and the practices are easy to apply

Limitations may include singly or in combination the effects of:

- ☛ Gentle slopes;
- ☛ Moderate susceptibility to wind and water erosion;
- ☛ Less than ideal soil depth;
- ☛ Somewhat unfavourable soil structure and workability;
- ☛ Slight to moderate salinity or sodicity easily corrected but likely to recur;
- ☛ Occasional damaging flooding;
- ☛ Wetness correctable by drainage but existing permanently as a moderate limitation; and
- ☛ Slight climatic limitations on soil use and management.

Limitations may cause special soil-conserving cropping systems, soil conservation practices, water-control devices or tillage methods to be required when used for cultivated crops.

#### 5.5.5.1.2 Grazing Class V

Land in Class V has little or no erosion hazard but have other limitations impractical to remove that limit its use largely to pasture, range, woodland or wildlife food and cover. Limitations restrict the kind of plants that can be grown and prevent normal tillage of cultivated crops. Pastures can be improved and benefits from proper management can be expected. Land is nearly level. Some occurrences are wet or frequently flooded. Other are stony, have climatic limitations, or have some combination of these limitations.

Examples of Class V Limitations are:

- ☛ Valley bottoms subject to frequent flooding that prevents the normal production of cultivated crops;
- ☛ Nearly level land with a growing season that prevents the normal production of cultivated crops;
- ☛ Level or nearly level stony or rocky land; and

- Ponded areas where drainage for cultivated crops is not feasible but which are suitable for grasses or trees

Land capability is expected to remain the same as no new mining infrastructure will be constructed as part of the project. An adit has already been developed to support the UG mining at KPSX together with the supporting UG conveyors. Only additional ventilation shafts and rescue boreholes will be constructed in strategic areas as the mining advances for both KPSX and KPSS. As such crop production can continue without disturbance.

### 5.5.5.2 *Impact Assessment*

#### 5.5.5.2.1 *Construction Phase*

The expansion of underground workings will be done on already disturbed areas and is not envisaged to result in significant impacts on the soils within the project area. All the required infrastructure is already in place except for additional ventilation shafts and rescue boreholes will be constructed in strategic areas as the mining advances for both KPSX and KPSS. The strategic positions in which the additional ventilation shafts and rescue boreholes will be located have not been specified. As such, no impacts are expected during the construction phase of the project.

#### 5.5.5.2.2 *Operational Phase*

During the operational phase, site clearing is necessary for the preparation of surface for the installation of additional ventilation shafts and rescue boreholes. When soil is removed, the physical properties are changed, and the soils' chemical properties will deteriorate unless effectively managed. When organic matter is removed, either by the clearing of an area for development or by erosion, the soils' fertility is reduced due to no nutrient input to the soils. Vehicles will drive on the soil surface, thereby causing compaction of the soils. This reduces infiltration rates and the ability for plant roots to penetrate the compacted soil. The installation process can result in additional sediment ending up in the water course due to earthworks or trenches used to divert water away from working areas. Sediment can result in silt build-up downstream, increase the turbidity of the water and result in habitat changes. Given the limited nature of the earthworks, sedimentation is not anticipated to occur to a significant degree.

#### 5.5.5.2.3 *Decommissioning and Rehabilitation Phase*

The major impacts to consider in the rehabilitation of the site will be the loss of topsoil as a resource through erosion and compaction. When topsoil is compacted or eroded, the soil profile loses effective rooting depth, water holding capacity and fertility. When the decommissioning and removal of infrastructure takes place, vehicles could drive on the rehabilitated surfaces causing compaction them and this in turn reduces infiltration rates as well as the ability for plant roots to penetrate the compacted soil. During the decommissioning phase, the following activities will take place:

- Demolition of the infrastructure areas.
- Ripping of compacted areas to loosen soil.
- Top soiling of all disturbed areas.
- Vegetation establishment in all disturbed areas.

### 5.5.5.3 Soil management

#### 5.5.5.3.1 Soil stripping for the installation of additional ventilation shafts and rescue boreholes

Soils should be stripped and replaced in a similar location in the catena to their natural location. Wetland soils should not be stripped and stockpiled at all. This section provides details of the depths of topsoil to be stripped according to soil type and a stripping procedure. Correct stripping of soils will ensure that enough soils are available for rehabilitation and that the soils are of adequate quality to support vegetation growth. The steps that should be taken during soil stripping are as follows:

- ✔ If possible, soil material should be stripped when it is in a lightly moist conditions to minimise compaction (i.e., when they are dry).
- ✔ Stripping should be supervised to ensure that the various soils are not mixed.
- ✔ Topsoil should be stored separately from subsoil because it contains more nutrients and microbes.
- ✔ Soil stripping and stockpiling of the soils should be done in a single action to reduce compaction and to increase the viability of the seed bank contained in the stripped soil surface.
- ✔ Demarcate boundaries of different soil horizons.
- ✔ Define cut-off horizons in simple terms that the stripping operator can understand.

#### 5.5.5.3.2 Stockpiling of stripped soils

This section provides topsoil stockpile management measures which aim to conserve topsoil in a condition as close as possible to its original state:

- ✔ Separate stockpiles for topsoil and subsoil because topsoil contains more nutrients and microbes.
- ✔ Stockpiles should be kept minimal and stockpiles should be revegetated with indigenous grass to minimise loss of soil quality and maintained. Stockpiles should be clearly signposted for easy identification. Locations should be accurately surveyed, and data recorded relating to the soil type and volume.
- ✔ Stockpile should be located outside proposed disturbance areas.
- ✔ Stockpiles should be in areas away from drainage lines or windy areas to minimise the risk of soil erosion.
- ✔ Minimise compaction during stockpile creation and revegetate to avoid erosion losses. A contingency plan for preventing wind erosion and dust from topsoil stockpiles is to apply hydro mulching to create a crust and provide a growing medium for vegetation on the surface of the stockpile.
- ✔ No waste material should be placed on the stockpiles.
- ✔ Equipment movement on top of the soil stockpiles should be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.
- ✔ Soil erosion should be controlled on stockpiles by having control measures to reduce erosion risk such as erosion control blankets, erosion berms, soil binders, revegetation, contours, diversion banks and spillways.

#### 5.5.5.3.3 Soil replacement and amelioration

All soils should be replaced to a similar depth as was encountered prior to the mining operation. However, soils can be replaced to a depth (0.5 m) that will sustain moderate cultivation land capability. It is recommended that the soils should be replaced as follows:

- ✔ Soil horizons (topsoil and subsoil) should be replaced in the same sequence in which they were stripped.
- ✔ The usable subsoil material should be replaced on the reshaped spoil, followed by the topsoil, and ensure natural revegetation with the indigenous grass species that were originally in the area.
- ✔ Soils should be moved when dry to minimise compaction.
- ✔ Compaction should be minimised by use of appropriate equipment and replacing soils.
- ✔ Minimise compaction during smoothing of replaced soils by using dozers rather than graders.
- ✔ Following replacement, all soils should be ripped to full rooting depth using dozer rippers.

#### 5.5.5.3.4 Supervision and Responsibilities

Close supervision and monitoring of the stripping process is required to ensure that soils are stripped correctly. Table 5-15 provides roles and responsibilities of the people that will be responsible for implementing excavations and stockpiling procedures. The responsibilities of the contractor need to be documented in contract documents.

**Table 5-15: Supervision and Monitoring Program**

Aspect	Measures and Actions	Timeframe/Frequency	Responsibility
Soil erosion and sediment control	Clearing activities must be restricted to the intervention areas.	During the installation of the installation of additional ventilation shafts and rescue boreholes	Contractors, Environmental Control Officer and Project Manager
Waste management	Bins must be provided for disposal of waste during construction.	During the installation of the installation of additional ventilation shafts and rescue boreholes	Contractors, Environmental Control Officer and Project Manager
Hazardous materials	Spillage plan must be developed. Refuelling must be done offsite to prevent potential soil pollution from spillage. Spillages must be reported immediately.	During the installation of the installation of additional ventilation shafts and rescue boreholes	Contractors, Maintenance Manager, Environmental Control Officer and Project Manager





Aspect	Measures and Actions	Timeframe/Frequency	Responsibility
Equipment and storage areas	Equipment maintenance must be done offsite. Storage areas must be within the fenced area and located away from all sensitive areas	During the installation of the installation of additional ventilation shafts and rescue boreholes	Contractors, Environmental Control Officer and Project Manager
Stockpile management	Stockpiled soils must not be located far away from replacement areas. Must be protected from potential erosion and limit the height. Must be kept clear of weeds and alien vegetation.	During the installation of the installation of additional ventilation shafts and rescue boreholes	Contractors, Environmental Control Officer and Project Manager
Land Use	Maintain and minimise land use change within the license areas. Evaluation of land use within the mining precinct using satellite imagery	Annually	Environmental Control Officer Mine Environmental Manager
Rehabilitated areas	Maintain the quality and condition of rehabilitated areas. Continuous monitoring of rehabilitated areas for closure compliance	Annually	Environmental Control Officer Mine Environmental Manager

## 5.6 Hydrogeology

The information in this section was compiled from the "Klipspruit Colliery: Hydrogeological Impact Assessment Report" compiled by Niara Environmental Consulting in 2026 which includes updated groundwater impact predictions associated with dewatering, including mine water inflow volumes into opencast and underground workings, predicted drawdown and radius of influence and post-closure groundwater rebound and potential decant considerations. (Refer to Appendix G).

### 5.6.1 Aquifer types

The study area comprises of three aquifer system, namely:

-  Shallow perched aquifer
-  Upper weathered aquifer
-  Fractured aquifer
-  Pre-Karoo fractured aquifer

The physical thicknesses for the three different aquifer types, are as follows (SRK, 2009):

-  Shallow perched aquifer: 1 m - 5 m

- 🌿 Shallow weathered zone Karoo aquifer: 8 m - 28 m; and
- 🌿 Deep Karoo aquifer (above the Dwyka Till): 20 m - 90 m.

### ***Upper weathered aquifer***

According to Hodgson and Krantz (1998), this aquifer occurs within the upper zone, ranging from 5 m to 12 m. Groundwater movement within the aquifer is lateral (Vermeulen and Usher, 2006). Shallow aquifer at Klipspruit attains a thickness of 8 – 28 m below ground level, with estimated saturated thickness of 5 m – 25 m (SRK, 2009). The weathered aquifer occurs above impermeable shale layer and clay. Groundwater that infiltrates to the bottom of the aquifer above this impermeable layer. Seepage in the form of fountains is common where the lateral movement of flowing groundwater encounters a barrier such as dolerite dykes, paleo topographic highs in the bedrock, or where the surface topography cuts into the groundwater level at streams (Vermeulen and Usher, 2006). The aquifer is characterised by good water quality due to rapid recharge from rainfall and dynamic groundwater flow that flushes leachable salt in the aquifer.

### ***Fractured aquifer***

The fractured aquifer occurs below shallow weathered zone. It has a physical thickness of 20 m – 90 m, mainly above the Dwyka Tillite. This aquifer has a saturated thickness of 17 m – 87 m (SRK, 2009). The aquifer is composed of fresh sediments that are well cemented, resulting in poor groundwater storage and movement. Groundwater occurrence within the aquifer is associated with secondary structures that enhance the flow and storage. Secondary structures are common in competent rock and best developed in sandstones. Historical exploration suggest that fractures decrease with depth. Groundwater occurrence may be lower in the fresh bedrock due to poorly connected fractures and lower permeability (Hodgson and Krantz, 1998). Groundwater quality contains high salt load. This is due to longer residence travel time that the water is in contact with the rock (Vermeulen and Usher, 2006).

### ***Pre-Karoo fractured aquifer***

This aquifer occurs beneath the Karoo supergroup. It forms part of the basement rocks in the area. Historical record has identified only few instances where this aquifer was intersected by drilling. This is due to the following (Hodgson and Krantz, 1998):

- 🌿 The great depth
- 🌿 Low yield
- 🌿 Inferior quality
- 🌿 Low recharge

The 2026 assessment confirms that groundwater occurrence and movement within the weathered and fractured aquifer systems may contribute to seepage and baseflow discharge to local drainage features and that groundwater–surface water linkages may be affected by dewatering associated with mining activities.

## 5.6.2 Aquifer parameters

Site specific data related to aquifer parameters were sourced from Digby Wells (2018) report. This data is shown in Table 5-16. The parameters are summarised as follows.

### Slug Test Conducted at KPSX:

- ✔ The hydraulic conductivity of the mine section varies from 0.003 – 0.045 m/d. These tests were done on three boreholes namely BHPW03, BHPW08, and BHPW10 which comprises of hydraulic conductivity of 0.003 m/d, 0.045 m/d, and 0.004 m/d respectively.
- ✔ Fractures have hydraulic conductivity that varies from 0.053 – 0.348 m/d.
- ✔ Aquifer yield estimated from the three boreholes is 0.017 l/s for borehole BHPW03, 0.047 l/s for borehole BHPW08, and 0.02 l/s for borehole BHPW10.

### Slug Test Conducted at KPSS:

- ✔ Hydraulic conductivity of the two boreholes tested at KPSS is 0.006 m/d and 0.047 m/d for BHPS1 and BHPS2 respectively.
- ✔ Fractures are characterised by hydraulic conductivity of 0.097 m/d and 6.481 m/d estimated for borehole BHPS1 and BHPS2.
- ✔ The two boreholes comprise of yield that ranges from 0.024 l/s to 0.224 l/s.

**Table 5-16: Hydraulic Conductivities of KPSX and KPSS: South (Digby Wells, 2018)**

(m <sup>2</sup> /d)	Yield of borehole (L/s)	1st estimate of sustainable yield (L/s)	T-value (m <sup>2</sup> /d)				K-value (m/d)	
			Formation in vicinity of borehole	Average for formation	Fracture estimate from Svenson-equation	Fracture	Fracture	Formation in vicinity of borehole
<b>Slug Test Conducted at KPSX</b>								
BHPW03	0.017	0.003	0.105	0.01	0.332	0.011	0.053	0.003
BHPW08	0.047	0.009	0.284	0.028	1.117	0.07	0.348	0.045
BHPW10	0.02	0.004	0.117	0.012	0.381	0.013	0.066	0.004
<b>Slug Test Conducted at KPSS</b>								
BHPS1	0.024	0.005	0.145	0.014	0.492	0.019	0.097	0.006
BHPS2	0.224	0.045	1.346	0.135	7.373	1.296	6.481	0.047

Comprehensive statistical analyses of the data documented by SRK (2009) suggest the following hydraulic conductivity:

- ✔ Arithmetic mean: 1,279 m/day
- ✔ Median: 0,030 m/day
- ✔ Minimum: 0,002 m/day
- ✔ Maximum: 10,040 m/day

Harmonic mean: 0,010 m/day

Geometric mean: 0,088 m/day

Aquifer porosity for fine grained sandstones varies from 1% - 12% with an average of 5%. Medium to coarse grained sandstones ranges from 4% - 15% with an average of 9%. Effective porosity of the shallow aquifer is 3%, while the effective porosity of the deep aquifer is 0.67%.

The 2026 hydrogeological assessment incorporates available historical and site monitoring datasets (including prior investigations and monitoring records) as the baseline basis for evaluating groundwater behaviour and to support updated impact prediction and monitoring requirements.

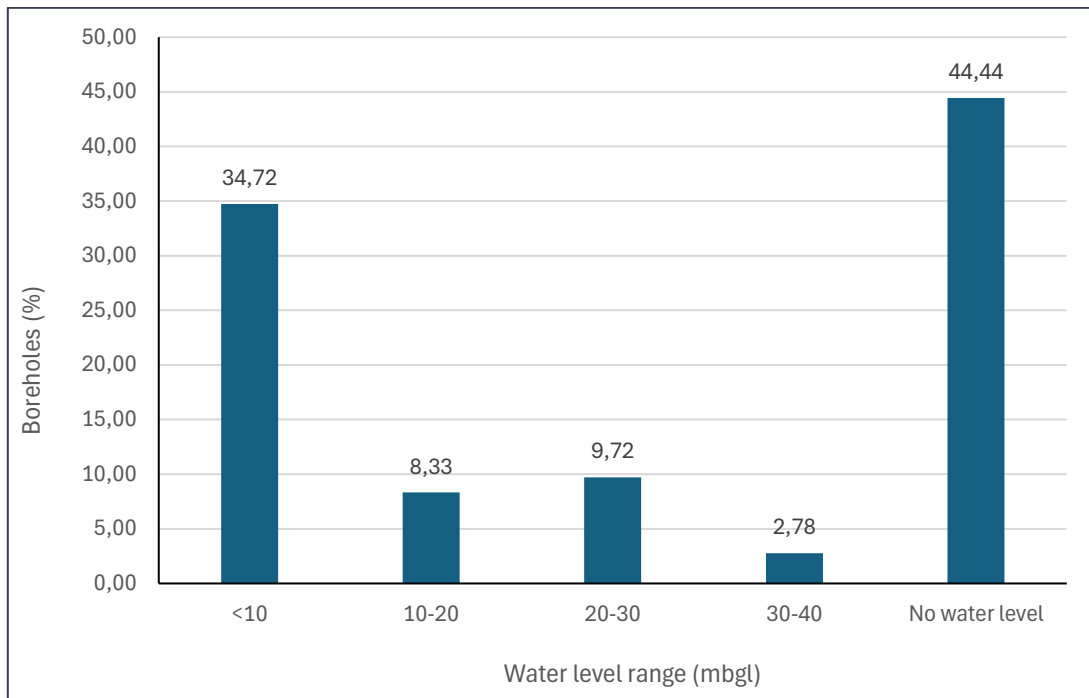
### 5.6.3 Groundwater levels

This section provides a summary of all groundwater level data available for KPS Colliery. The data was sourced from the reports compiled by Digby Wells (2015 and 2018) and Niara (2022). This data is shown in Table 5-17 and as well as Figure 5-17. Borehole distribution is shown in Figure 16-18.

In total, 72 boreholes that are widely distributed within the KPS mining and adjacent area were assessed. Groundwater level within KPS and immediate surrounding varies from 1 – 38 mbgl. Available water level data suggest that majority of boreholes have water level of less than 10 mbgl. 44% of boreholes did not have groundwater level data due to access.

**Table 5-17: Summary of water level data**

Water level range	No of boreholes	Percent
<10	25	34.72
10-20	6	8.33
20-30	7	9.72
30-40	2	2.78
No water level	32	44.44



**Figure 5-17: Summary of water level data**

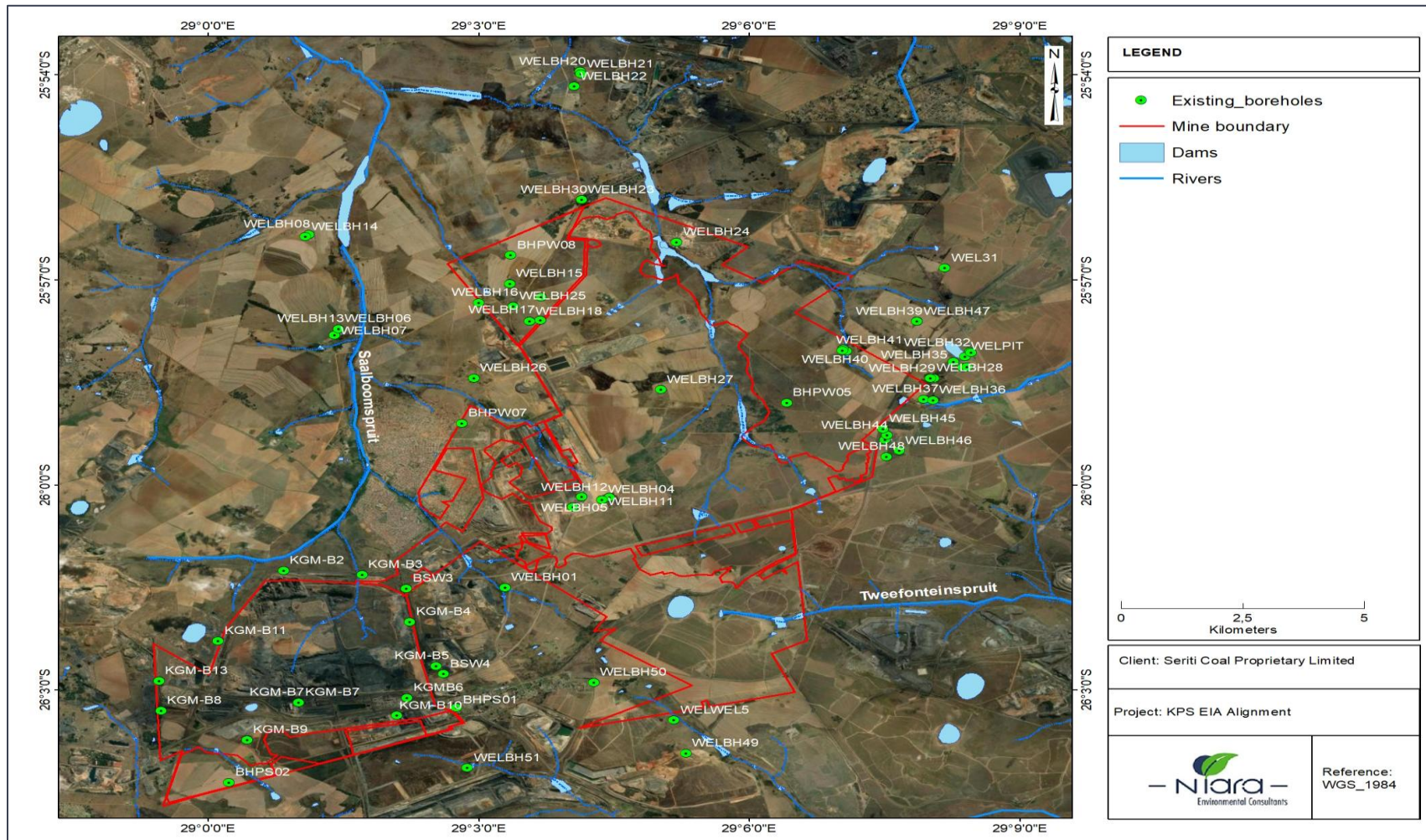


Figure 5-18: Distribution of existing boreholes

**Table 5-18: Summary of existing boreholes (Digby Wells, 2015; Digby Wells, 2018; Niara, 2022)**

Site Name	Latitude	Longitude	Elevation (mamsl)	Water level (mbgl)	Farm Name	Site Use
WELBH01	-26.025	29.055	1527	15	Oggiesfontein 4 IS	Domestic
WELBH02	-26.00541	29.06751	1533	8	Wilbeestfontein 327 JS	Domestic
WELBH03	-26.00287	29.06911	1580	10	Wilbeestfontein 327 JS	Domestic - potable water supply
WELBH04	-26.00364	29.07285	1578	-	Wilbeestfontein 327 JS	Unknown - equipped
WELBH05	-26.00305	29.0742	1582	11	Wilbeestfontein 327 JS	Domestic
WELBH06	-25.962	29.0242	1580	26	Wilbeestfontein 327 JS	Domestic
WELBH07	-25.9635	29.02343	1570	1	Wilbeestfontein 327 JS	Not used
WELBH08	-25.93897	29.01865	1539	-	Oggiesfontein 4 IS	Unknown - equipped
WELBH09	-26.00541	29.06751	1532	7	Prinshof 2 IS	Monitoring
WELBH10	-26.00287	29.06911	1527	8	Prinshof 2 IS	Monitoring
WELBH11	-26.00364	29.07285	1505	23	Roodepoort 326JS	Domestic
WELBH12	-26.00305	29.0742	1506	25	Roodepoort 326JS	Domestic
WELBH13	-25.962	29.0242	1500	24	Roodepoort 326 JS	Domestic
WELBH14	-25.93952	29.01802	1501	-	Roodepoort 326 JS	Unknown - equipped
WELBH15	-25.95097	29.05588	1546	8	Hartebeestlaagte 325 JS	Not used
WELBH16	-25.95562	29.05012	1536	-	Roodepoort 326JS	Unknown
WELBH17	-25.95983	29.0615	1553	38	Hartebeestlaagte 325 JS	Domestic
WELBH18	-25.96015	29.05949	1554	-	Hartebeestlaagte 325 JS	Unknown - equipped
WELBH19	-25.95427	29.06158	1555	-	Hartebeestlaagte 325 JS	Unknown - equipped
WELBH20	-25.89924	29.06892	1510	6	Elandsfontein 309 JS	Not used
WELBH21	-25.89987	29.06894	1509	7	Elandsfontein 309 JS	Domestic
WELBH22	-25.90289	29.06771	1499	9	Hartebeestlaagte 325 JS	Not used
WELBH23	-25.93049	29.06913	1523	-	Hartebeestlaagte 325 JS	Domestic - potable water supply
WELBH24	-25.94082	29.08669	1510	25	Roodepoort 326JS	Domestic
WELBH25	-25.95648	29.05643	1555	-	Hartebeestlaagte 325 JS	Domestic - potable water supply






Site Name	Latitude	Longitude	Elevation (mamsl)	Water level (mbgl)	Farm Name	Site Use
WELBH26	-25.97401	29.04921	1548	8	Wilbeestfontein 327 JS	Domestic
WELBH27	-25.97678	29.08376	1589	-	Tweefontein 328 JS	Unknown - equipped
WELBH28	-25.97401	29.1335	1553	16	Tweefontein 328 JS	Domestic
WELBH29	-25.97403	29.13413	1590	7	Vlaglaagte 330 JS	Domestic
WELBH30	-25.93049	29.06913	1589	5	Vlaglaagte 330 JS	Domestic
WELBH32	-25.96779	29.14109	1588	-	Vlaglaagte 330 IS	Unknown - equipped
WELBH33	-25.97121	29.14026	1590	6	Vlaglaagte 330 IS	Domestic
WELBH34	-25.97143	29.13954	1591	4	Vlaglaagte 330 IS	Domestic
WELBH35	-25.97	29.13779	1592	11	Vlaglaagte 330 JS	Domestic
WELBH36	-25.97937	29.13402	1591	28	Vlaglaagte 330 JS	Domestic
WELBH37	-25.97911	29.13225	1595	20	Vlaglaagte 330 JS	Domestic
WELBH39	-25.96014	29.13109	1574	5	Weltevreden 324 JS	Not used
WELBH40	-25.96687	29.11738	1566	3	Weltevreden 324 JS	Not used
WELBH41	-25.96723	29.11723	1567	4	Weltevreden 324 JS	Not used
WELBH42	-25.96733	29.11804	1567	2	Weltevreden 324 JS	Domestic
WELBH43	-25.98901	29.12516	1605	2	Vlaglaagte 330 JS	Domestic
WELBH44	-25.98794	29.12558	1604	2	Vlaglaagte 330 JS	Not used
WELBH45	-25.98637	29.12474	1606	-	Vlaglaagte 330 JS	Unknown
WELBH46	-25.9917	29.12778	1606	34	Vlaglaagte 330 JS	Not used
WELBH47	-25.96014	29.13109	1612	17	Vlaglaagte 330 JS	Domestic
WELBH48	-25.99313	29.12546	1609	28	Tweefontein 328 JS	Domestic
WELBH49	-26.0654	29.08832	1580	2	Zaaiwarer 11 IS	Monitoring
WELBH50	-26.04813	29.07134	1606	-	Grootpan 7 IS	Unknown - equipped
WELBH51	-26.069	29.048	1580	-	Goedevonden 10 IS	Unknown - equipped
WELPIT	-25.96872	29.13995	1587	3	Vlaglaagte 330 IS	Domestic
WELPIT01	-25.96749	29.1409	1589	3	Vlaglaagte 330 IS	Domestic

Site Name	Latitude	Longitude	Elevation (mamsl)	Water level (mbgl)	Farm Name	Site Use
WELSPR4			1514	0	Weltevreden 324 JS	Groundwater spring
WELWEL3			1513	0	Weltevreden 324 JS	Groundwater spring
WELWEL5	-26.05738	29.08616	1570	7	Zaaiwarer 11 IS	Domestic
WEL31	-25.94717	29.13619	1576	7	Blaauwkrans 323 JS	Domestic
BHPS01	-26.05433	29.04603	1600	Not measured		Hydrogeological investigation
BHPS02	-26.07255	29.004				Hydrogeological investigation
BHPW05	-25.98	29.107				Hydrogeological investigation
BHPW07	-25.985	29.047				Hydrogeological investigation
BHPW08	-25.944	29.056				Hydrogeological investigation
BSW3	-26.02528	29.03669				Hydrogeological investigation
BSW4	-26.04609	29.04364				Hydrogeological investigation
KGM-B10	-26.0562	29.03501				Hydrogeological investigation
KGM-B11	-26.038	29.002				Hydrogeological investigation
KGM-B13	-26.04781	28.99101				Hydrogeological investigation
KGM-B2	-26.02091	29.01407				Hydrogeological investigation
KGM-B3	-26.0219	29.02858				Hydrogeological investigation
KGM-B4	-26.0334	29.03739				Hydrogeological investigation
KGM-B5	-26.04416	29.04227				Hydrogeological investigation
KGMB6	-26.0519	29.03684				Hydrogeological investigation
KGM-B7	-26.05303	29.01686				Hydrogeological investigation
KGM-B7	-26.05303	29.01686				Hydrogeological investigation
KGM-B8	-26.05506	28.99138				Hydrogeological investigation
KGM-B9	-26.06214	29.00732				Hydrogeological investigation

The 2026 groundwater impact prediction indicates that dewatering associated with opencast and underground workings will result in a decline in groundwater levels, with the highest drawdown predicted within the mine boundary. The assessment indicates that the drawdown effect decreases with distance from dewatering points, but that groundwater level decline may also occur outside the mine boundary. The predicted drawdown at the outer edge of the affected zone is indicated as approximately 3 m, increasing towards the mine areas, and dewatering-related groundwater level decline is expected to affect baseflow discharge to nearby drainage features.

#### 5.6.4 Aquifer Classification

The aquifer underlying the study area was classified in accordance with Parsons' (1995) aquifer system management classification document titled "A South African Aquifer System Management Classification." Based on the above document, the following types of aquifer systems are recognized:

-  Sole Aquifer System: An aquifer that is used to supply 50% or more of domestic water for a given area and for which there are no reasonably available alternative sources should the aquifer be impacted upon or depleted. Aquifer yields and natural water quality are immaterial.
-  Major Aquifer System: highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good (electric conductivity of less than 150 mS/m).
-  Minor Aquifer System: These can be fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important for local supplies and in supplying base flow for rivers.
-  Non-Aquifer System: These are formations with negligible permeability that are regarded as not containing groundwater in exploitable quantities. The water quality may also be such that it renders the aquifer unusable. However, groundwater flow through such rocks, although imperceptible, does take place and needs to be considered when assessing the risk associated with persistent pollutants.
-  Special Aquifer System: An aquifer designated as such by the Minister of Water Affairs after due process.

Based on information sourced from groundwater monitoring, water use information databases, information collected during the hydrocensus survey, and information obtained from the DWA (2012) classification, the study area is classified as minor aquifer system. This suggest that the aquifer has variable permeability, water quality variable, and limited aquifer extent. Table 6-19 shows the point scoring system for the aquifer while Figure 5-19 shows the distribution of aquifer class.

**Table 5-19: Ratings for the Aquifer System Management.**

Aquifer System Management Classification		
Class	Points	Project area
Sole Aquifer System	6	
Major Aquifer System	4	

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<b>Minor Aquifer System</b>	<b>2</b>	<b>2</b>
Non-Aquifer System	0	
Special Aquifer System	0 – 6	

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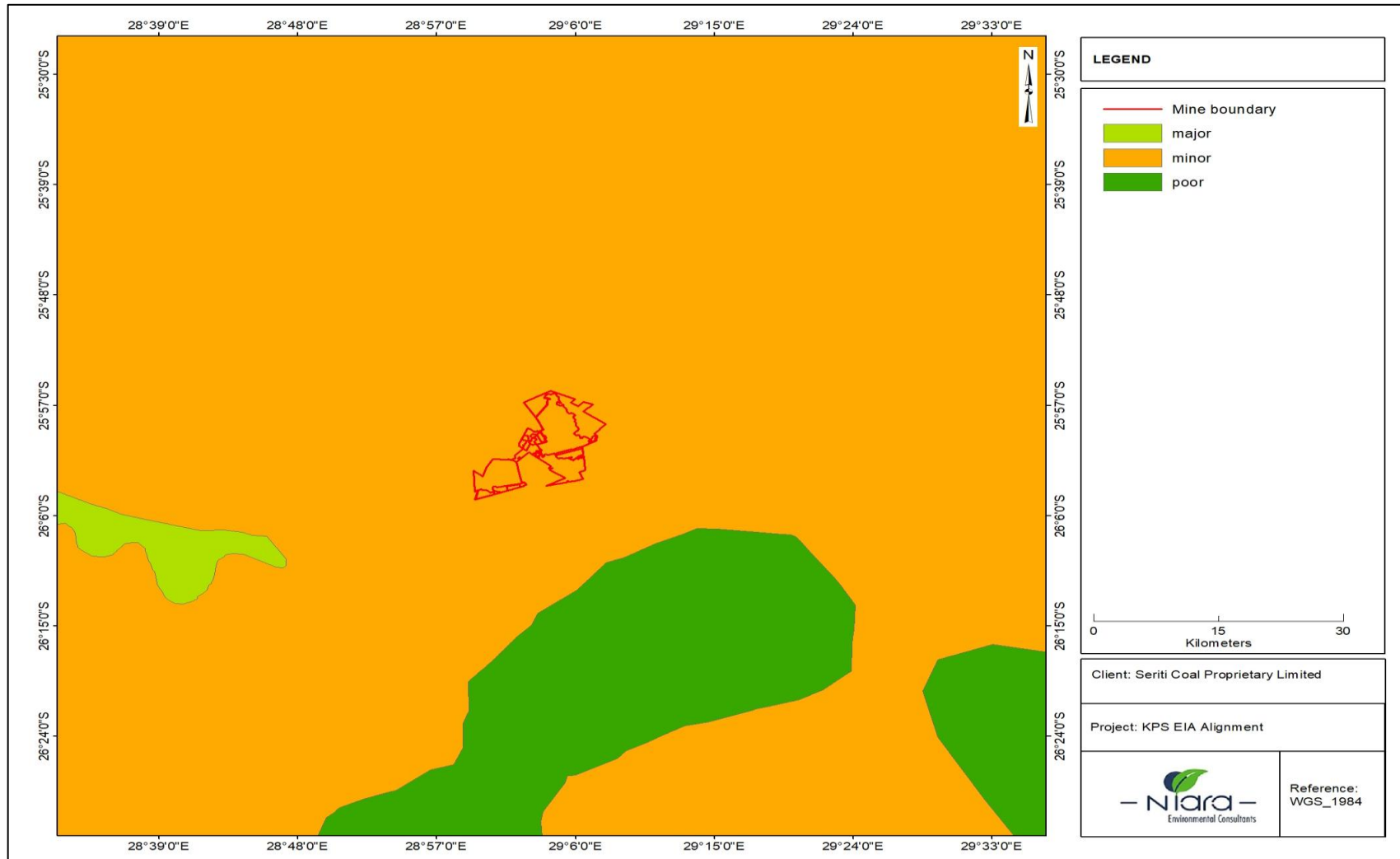


Figure 5-19: Aquifer classification map

### 5.6.5 Aquifer protection classification

Aquifer protection classification has been discussed in detail by Parsons' (1995). Characterisation of aquifer protection comprises four components, which include:

- ✔ Determination of Aquifer System Management Classification in terms of special, non-aquifer, poor, minor, major, and sole. This allows the allocation of points from 0 to 6.
- ✔ Determination of aquifer vulnerability classifications of the site in terms of least, moderate, and most. This allows the allocation of points from 1 to 3.
- ✔ Determination or calculation of the Groundwater Quality Management (GQM) Index. This allows the calculation of the GQM index based on the formular presented below.
- ✔ Classification of GQI results in terms of Limited, Low, Medium, High, and Strictly Non-Degradation level of protection based on the point scoring of less than 1 and more than 10.

The GQM Index is used to define the level of groundwater protection required. The GQM Index is obtained by multiplying the rating of the aquifer system management and the aquifer vulnerability as presented above. The following formular is applicable:

$$\text{GQM Index} = \text{Aquifer System Management} \times \text{Aquifer Vulnerability}$$

Table 5-20 presents ratings for groundwater management classifications based on aquifer vulnerability and aquifer system management classifications. This classification implies that the mining area falls under the medium level of aquifer protection. The points scoring system for the GQM index for the study area is presented in Table 5-21, where GQM is equal to 4.

**Table 5-20: Rating for Groundwater Quality Management Classification System.**

Aquifer System Management Classification		Aquifer Vulnerability Classification			
Both small & Large portion		Large portion		Small Portion	
Class	Points	Class	Points	Class	Points
Sole Aquifer System	6	Most	3	<b>Most</b>	<b>3</b>
Major Aquifer System	4	<b>Moderate</b>	<b>2</b>	Moderate	2
<b>Minor Aquifer System</b>	<b>2</b>	Least	1	Least	1
Non-Aquifer System	0				
Special Aquifer System	0 – 6				

**Table 5-21: Rating for the GQM Index for the Study Area.**

GQM Index	Level of Protection	Project area
<1	Limited	4
1 - 3	Low Level	
3 - 6	Medium Level	

GQM Index	Level of Protection	Project area
6 – 10	High Level	
>10	Strictly non-degradation	

Aquifer susceptibility was discussed in detail by Parsons' and Conrad (1995). According to the author, aquifer susceptibility is obtained by multiplying the rating of the aquifer system management by the aquifer vulnerability. The method and formular are like the GQM Index methodology, but with different criteria to classify the results. The following procedure is applicable:

- ✔ Determination of Aquifer System Management Classification in terms of special, non-aquifer, poor, minor, major, and sole. This allows the allocation of points from 0 to 6.
- ✔ Determination of aquifer vulnerability classifications of the site in terms of least, moderate, and most. This allows the allocation of points from 1 to 3.
- ✔ Determination or calculation of aquifer susceptibility. This allows the calculation of aquifer susceptibility based on the formular presented below.
- ✔ Classification of aquifer susceptibility in terms of low, medium, and high based on a point score of 1 to 9.

This is then used to define the susceptibility of the aquifer to contamination. The following formular is applicable.

$$\text{Aquifer Susceptibility} = \text{Aquifer System Management} \times \text{Aquifer Vulnerability}$$

**Table 5-22 presents the applicable definitions to determine the aquifer susceptibility class. According to the table presented, a low aquifer vulnerability class and poor groundwater region will result in low susceptibility, whereas a high vulnerability class and major aquifer region will result in high susceptibility. According to the classification system, the study area falls under the medium aquifer susceptibility (**

Table 5-22 and Table 5-23).

The aquifer susceptibility classification and GQM Index classification have classified the study area into medium levels of aquifer protection. This classification requires reasonable and sound groundwater management strategies and mitigation measures to minimize and reduce the impacts.

DWS water quality management objectives are to protect human health and the environment. Therefore, the focus must be to:

- ✔ Prevent the introduction of contamination into the aquifer.
- ✔ Predict contamination movement and spread of plume.
- ✔ To remove the contaminants through rehabilitation and restoration of groundwater resources.

These objectives present the challenges highlighted by the National Academy of Sciences (1984) and form the basis for better dealing with contamination sources within the proposed mining facilities. Figure 6-20 shows the distribution of aquifer susceptibility in the area.

**Table 5-22: Basis for assigning aquifer contamination susceptibility classis.**

Aquifer System Management Class	Vulnerability Class		
	Low/Least (1)	Medium (2)	High (3)
Poor groundwater region (1)	Low susceptibility (1)	Low susceptibility (2)	Medium susceptibility (3)
Minor groundwater region (2)	Low susceptibility (2)	Medium susceptibility (4)	High susceptibility (6)
Major groundwater region (3)	Medium susceptibility (3)	High susceptibility (6)	High susceptibility (9)

**Table 5-23: The following classification is applicable:**

GQM Index	Susceptibility	Large portion
1 - 2	Low	
3 - 4	Medium	4
6 - 9	High	

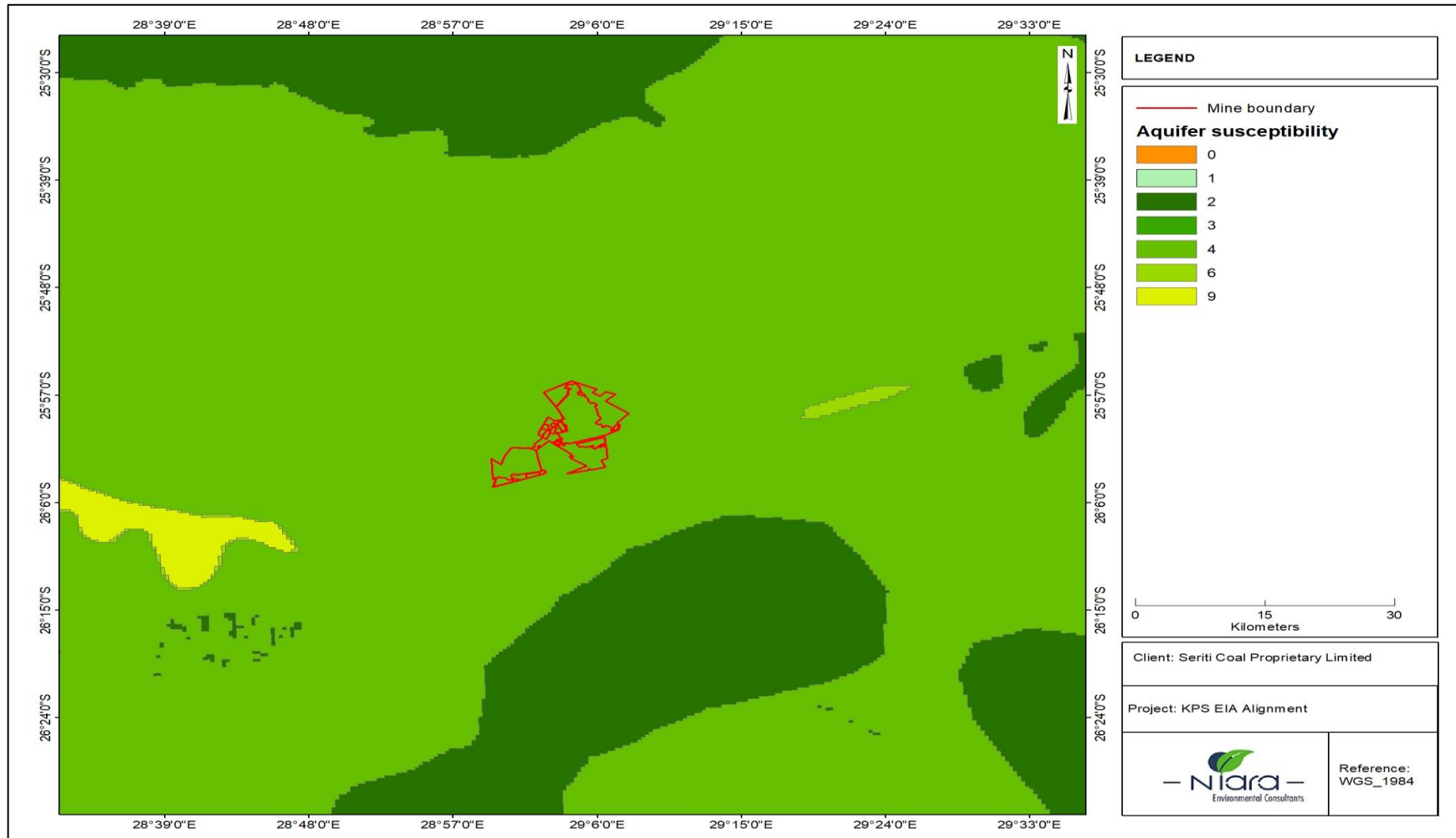


Figure 5-20: Aquifer susceptibility.

### 5.6.6 Groundwater Recharge

Groundwater recharge to un-impacted Karoo type aquifer is in the order of 1% to 3% of the annual precipitation. SRK (2009) report documented groundwater recharge based on the annual precipitation of 750 mm/a. The following recharge was estimated (SRK, 2009):

- ✔ Groundwater recharge in un-impacted mining environments of between 1.5% and 3.0%. This calculates to between 11.25 mm/year and 22.5 mm/year, respectively.
- ✔ Active cuts in strip mines 100% of annual rainfall.
- ✔ Spoil heaps 50% of annual rainfall.
- ✔ Rehabilitated, fully re-vegetated material in strip mines 12% of annual rainfall.
- ✔ Dolerite dykes and sills Intrusion specific. Can either act as a preferential flow zone or as a geohydrological barrier.

Bord and pillar panels 2% - 3% of annual rainfall. The 2026 assessment confirms that mine water inflows to opencast and underground workings (and the associated requirement for dewatering) are key drivers of groundwater level response during operations and that these dewatering volumes are considered in the updated impact prediction.

### 5.6.7 Groundwater potential contaminants

KPSX and KPSS comprises of both underground and opencast mining. The operations have constructed various infrastructures to support mining. The following infrastructures have been identified as areas where contamination may originate.:

**Contamination sources at KPSX includes the following:**

- ✔ Open-pit BD including ramps and box cuts
- ✔ Underground working
- ✔ Internal haul roads; and haul roads for the transport of ROM coal to KPS
- ✔ ROM stockpile and tip area
- ✔ Overland conveyor
- ✔ PCDs and associated pipelines to the PCPP
- ✔ Diesel and oil storage tanks
- ✔ Sewage treatment plant (STP)
- ✔ Workshops

**Contamination sources at KPSS include the following:**

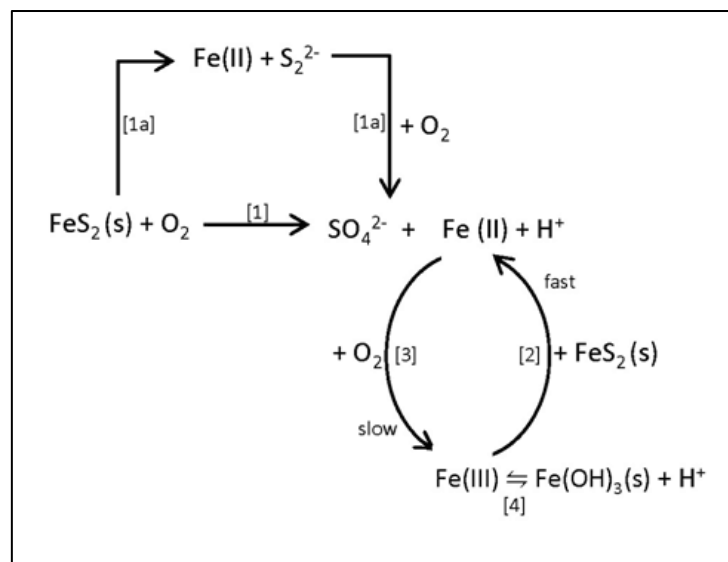
- ✔ Open pit including ramps and box cuts
- ✔ Underground working

- 🌿 Haul roads
- 🌿 Oil and refuelling facilities
- 🌿 Coal conveyor to KPS
- 🌿 PCD and associated pipelines to the KPS
- 🌿 Run of Mine (ROM) stockpiles
- 🌿 Workshops and fuelling bay
- 🌿 Coal tip

These facilities comprise of various contaminants. A contaminant is any physical, chemical, biological or radiological substance that is considered hazardous in a particular environment (Hattingh, 2003). Contamination is the introduction of contaminants into water resources (Morris et al., 2011). While the impacts of these facilities are common in mining, its extent and spread will most likely depends on water management options adopted at the mine.

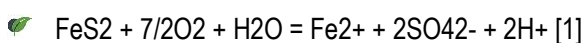
It is known that the generation of Acid Mine Drainage (AMD) in coal mining is common. This is because some coal reserves are characterised by pyrite bearing deposits that have potential to generate acid. It must be emphasised that not all coal mining will generate AMD. The generation of AMD in individual mine will depends on water management options and strategy, mitigation measures, and AMD strategy containing AMD prevention and prediction.

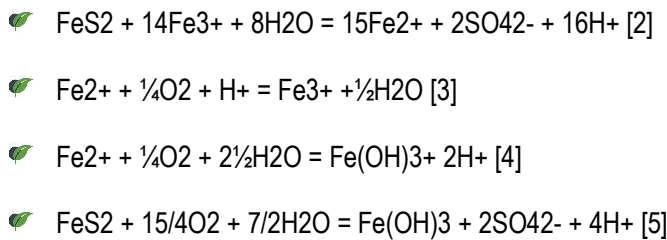
The following reaction summarised the oxidation process and formation of AMD:



**Figure 5-21: Oxidation of Pyrite (Stumm and Morgan, 1981).**

Reaction and AMD generating stages:

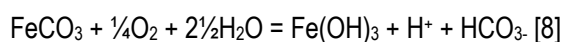
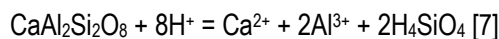
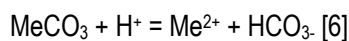




The resulting product of the above reactions is the generation of acidity, sulphur species, total dissolved solids (TDS), and metals. Sulphate is common in the resulting mine drainage water. It is present in association with TDS. TDS represents the amounts of dissolved species that includes sulphate, chloride, and bicarbonate.

Although sulphide minerals are known for acid generating potential, it is commonly present in associated with acid neutralising minerals. These are acid consuming minerals that includes carbonates and aluminosilicates. The reactions associated with acid consuming minerals are summarised as follows:

Neutralization Reactions:



The following documents are critical in establishing water management options and strategy to prevent the generation of contamination:

- 🌿 BPG A2: Water Management for Mine Residue Deposits (Department of Water Affairs and Forestry, DWAF, 2007a).
- 🌿 BPG A4: Pollution control dams (DWAF, 2007b).
- 🌿 BPG A6: Water Management for Underground Mines (DWAF, 2008a).
- 🌿 BPG G1 Storm Water Management (DWAF, 2006).
- 🌿 BPG G4: Impact Prediction (DWAF, 2008b).
- 🌿 BPG G5: Water Management Aspects for Mine Closure (DWAF, 2008c).
- 🌿 BPG H1: Integrated Mine Water Management (DWAF, 2008d).

**The following scenario are critical for water management at mine site:**

#### Mine residue deposit

*Residue includes any debris, discard, tailings, slimes, screenings, slurry, waste rock, foundry sand, beneficiation plant waste, ash and other waste product derived from or incidental to the operation of a mine or activity and which is stockpiled, stored or accumulated for potential reuse or recycling or which is disposed of. (Government Notice 704 of 4 June 1999; DWAF, 2008c).*

Residue deposits include any dump, tailings dams, slimes dams, ash dump, waste rock dump, in-pit deposit and any other heap, pile or accumulation of residue. (Government Notice 704 of 4 June 1999; DWAF, 2008c)

Figure 5-22 provides a schematic diagram of mine residue facility. It is common that the facility will generate seepage water containing contaminants. Irrespective of whether the facility is lined or not, groundwater and surface water will be at risk of contamination. Liner design will most likely reduce the impacts, but not entirely. Hence, water management strategy and AMD strategy are critical for mining.

Common impacts expected from the mine residue deposit includes:

- ✔ Contaminated seepage
- ✔ Contaminated runoff
- ✔ Infiltration of contaminated seepage water
- ✔ Contamination of groundwater
- ✔ Contamination of surface
- ✔ Discharge of contaminated baseflow to surface water
- ✔ Contaminated storm water leaving the site

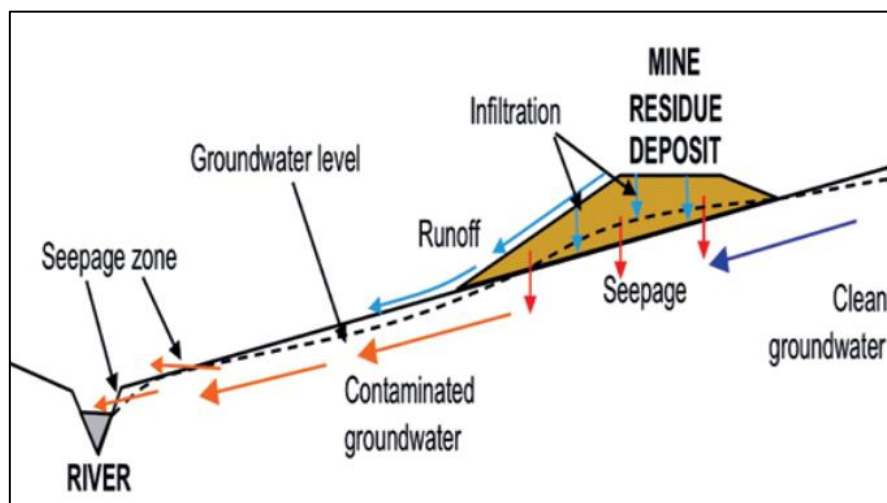


Figure 5-22: Mine residue deposit/discard dump and pathways (DWAF, 2008c).

Other scenario in the form of schematic diagrams is shown in Figure 5-23, Figure 5-24, and Figure 5-25. These scenarios are all applicable to KPSS and KPSX mining. In an attempt to establish water management options and AMD strategy, these aspects must be considered in order to establish measures that are site specific. These measures will most likely determine whether a mine is able to prevent, reduce, avoid and control the contamination generated from their facilities. Detail information is highlighted in the Best Practice Guideleine (BPG) listed above.

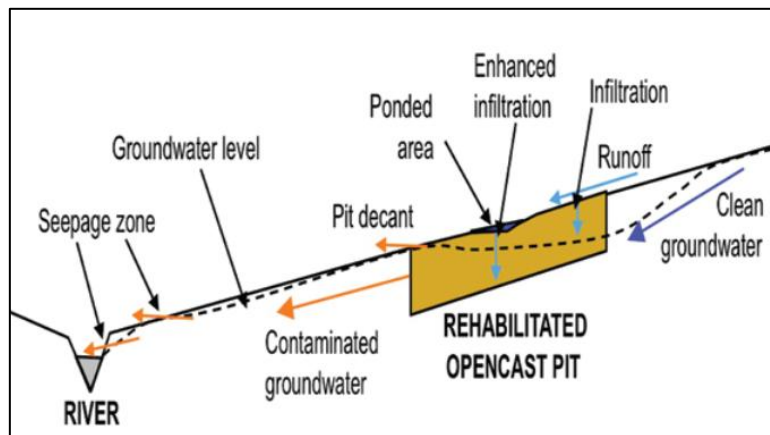


Figure 5-23: Open cast pit and pathways (DWAF, 2008c)

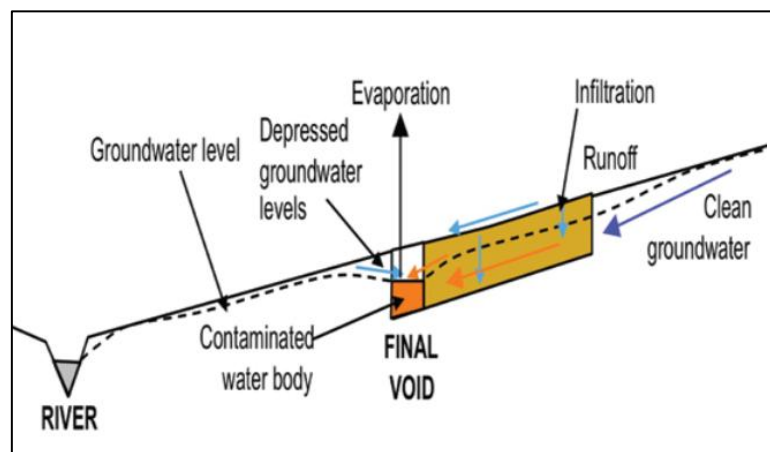


Figure 5-24: Rehabilitated area and pathways (DWAF, 2008c).

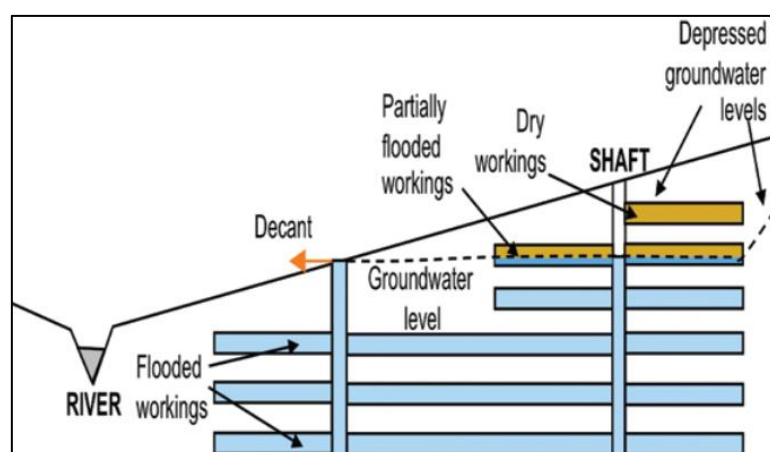


Figure 5-25: Underground mine and pathway (DWAF, 2008c).

A risk-based groundwater monitoring approach that includes background, source, plume, and impact monitoring to provide baseline conditions, early warning of contaminant migration, and receptor protection is recommended. Monitoring frequency recommended

includes groundwater quality monitoring on a quarterly basis, groundwater level monitoring on a monthly basis, and dewatering volume recording on a daily basis (flow meter) with monthly computation of volumes.

## 5.7 Wetlands

In 2024, Niara conducted a detailed wetland assessment study to support the transition of the mining method for Pit BD and Pit H from open cast to underground, considering all technical and environmental factors. The report is attached in Appendix E. The final wetland specialist assessment confirms that the proposed underground expansion will not result in direct impacts to delineated wetlands, as required surface infrastructure is already in place and only additional ventilation shafts and rescue boreholes will be constructed in strategic areas as mining advances.

A site visit was conducted to assess the presence, extent, ecological integrity, importance, and sensitivity of wetlands within the project area. Wetland delineation followed the hydro-geomorphic (HGM) Classification system, identifying each area accordingly. An ecological health assessment using the Wet-Health method evaluated the current state and ecological significance of each wetland unit, comparing its structure and function to natural reference conditions. Additionally, the WET-Eco-services tool assessed the ecological functions provided by each wetland unit. An impact assessment, guided by GN509 of 2016 methodology, evaluated potential impacts of proposed mining activities on identified wetlands within the project area. Key findings include:


- 🌿 The majority of the Klipspruit Colliery Mining Rights Area falls within the quaternary catchment B20G, with wetlands associated with the Saalboomspruit, a tributary of the Wilge River. The south-western portion of the site falls within the B11F catchment, which is bisected by the Olifants River, and a small portion at the north-east of the site occurs within the catchment B11G. Both quaternary catchments are regarded as Largely Modified, according to the Department of Water and Sanitation (DWS);
- 🌿 According to the National Freshwater Ecosystem Priority Areas (NFEPA) a Valley Floor: Channelled valley bottom wetland Rank 2 is identified within the proposed area. Therefore, the wetlands within the proposed area contributes towards maintenance of biodiversity within the greater catchment area.
- 🌿 Two types of wetlands were identified within the area proposed for an underground mine, these include a Hillslope Seepage Connected to a watercourse and a Channelled Valley Bottom Wetland.
- 🌿 Due to deviation from the reference condition, the hillslope seepage wetland connected to a watercourse located within the project area have been classified as follows:
  - PES-C: Moderately Modified where a moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact and
  - PES-D): Largely Modified where a large change in ecosystem processes and loss of natural habitat and biota has occurred.

- 🌿 The Channelled Valley Bottom Wetland located within the project area has deviated significantly from the reference condition such that it has been classified as Seriously Modified (PES: E) where the change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.
- 🌿 The Ecological Importance and Sensitivity of the wetlands within the project are considered to be High: these wetlands are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. These wetlands play a role in moderating the quantity and quality of water of major rivers;
- 🌿 Since no new surface mining infrastructure will be constructed as part of the project, except for the additional ventilation shafts and rescue boreholes it was concluded that, a buffer zone could not propose. The wetland specialist assessment records a commitment to implement the Seriti Land Management Way within an 80 m buffer zone around the delineated wetland areas, including ongoing monitoring within this buffer to prevent further degradation of wetlands.
- 🌿 Since no new surface mining infrastructure will be constructed, the impact assessment was conducted only for the operational and closure phases of mining.
- 🌿 The high-ranking impacts of the proposed underground mining at KPSX and KPSS on the receiving wetlands was found to be
  - Discharge of decant water into the receiving wetlands;
  - Pollution of water resources due to Acid Mine Drainage (AMD); and
  - Subsidence

### 5.7.1 Present Ecological Status (PES)

The identified wetlands within the project area are situated in an active mining zone that has historically been subjected to coal mining, human settlements, and agricultural activities over many years. These anthropogenic influences have resulted in several notable impacts on the wetlands, including:

- 🌿 Active mining activities in the direct catchment of the wetland area, as well as immediately adjacent to the wetland;
- 🌿 Mining activities encroaching into the edges of the wetland areas;
- 🌿 Crop farming encroaching into the edges of the wetland areas
- 🌿 Overburden and coal stock piling in close proximity to the wetland, potentially adding to the deteriorating water quality;
- 🌿 Impoundment of flow due to a dam;
- 🌿 A number of formal and informal road crossings leading to flow impoundment;
- 🌿 Illegal dumping that impacts the water quality;
- 🌿 Abandoned mine shaft;

 Active erosion (head cuts);

Based on the findings of the current assessment study, the present ecological state of the wetlands on site can be described as follows (See Figure 5-26 below).





Due to deviation from the reference condition, the hillslope seepage wetland connected to a watercourse located within the project area have been classified as follows:

- PES-C: Moderately Modified where a moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact and
- PES-D): Largely Modified where a large change in ecosystem processes and loss of natural habitat and biota has occurred.

The Channelled Valley Bottom Wetland within the project area has undergone significant deviation from its reference condition, leading to its classification as Seriously Modified (PES: E). This classification indicates substantial changes in ecosystem processes and considerable loss of natural habitat and biota, although some remnants of its original natural features are still discernible.

### 5.7.2 Ecological Importance and Sensitivity (EIS)

The wetlands within the project area form part of the Olifants River Primary catchment which is a heavily utilised and economically important catchment. Wetlands and rivers within the Olifants River Catchment upstream of Loskop Dam have been greatly impacted upon by various activities, which include mining, power stations, water abstraction, urbanization, agriculture etc. As a result of these impacts serious water quality and quantity concerns have been raised within the sub-catchment. Given this situation, and the fact that wetlands can support functions such as water purification and stream flow regulation, a high importance and conservation value is placed on all wetlands and rivers within the catchment that have as yet not been seriously modified. Within this context, an EIS assessment was conducted on the wetlands identified within the project areas. Further considerations that informed the IS assessment included:

-  The location of the study area within a vegetation type (Eastern Highveld Grassland) considered extensively transformed and threatened, having been classed as Vulnerable.
-  The wetland vegetation types of the area, Mesic Highveld Grassland Bioregion and Mesic Highveld Grassland Bioregion, which are considered to be Critically Endangered;
-  The largely modified state of the wetlands within the study area and the catchment, with most of the wetland habitat considered largely modified and extensively impacted by surrounding mining and agricultural activities;
-  The NFEPA status of the identified hillslope seepage wetland and the associated ranking.

It is these considerations that have informed the scoring of the wetlands in terms of their importance and sensitivity. The Ecological Importance and Sensitivity of the wetlands within the project are considered to be **High: these wetlands are considered to be**

**ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. These wetlands play a role in moderating the quantity and quality of water of major rivers** (see Figure 6-32 below).

The wetland specialist assessment calculates the Ecological Importance and Sensitivity as EIS-C (Moderate) for the Hillslope Seepage Wetland and EIS-C (Moderate) for the Channelled Valley Bottom Wetland, with an additional classification of EIS-D (Low marginal) noted for a channelled valley bottom wetland unit.

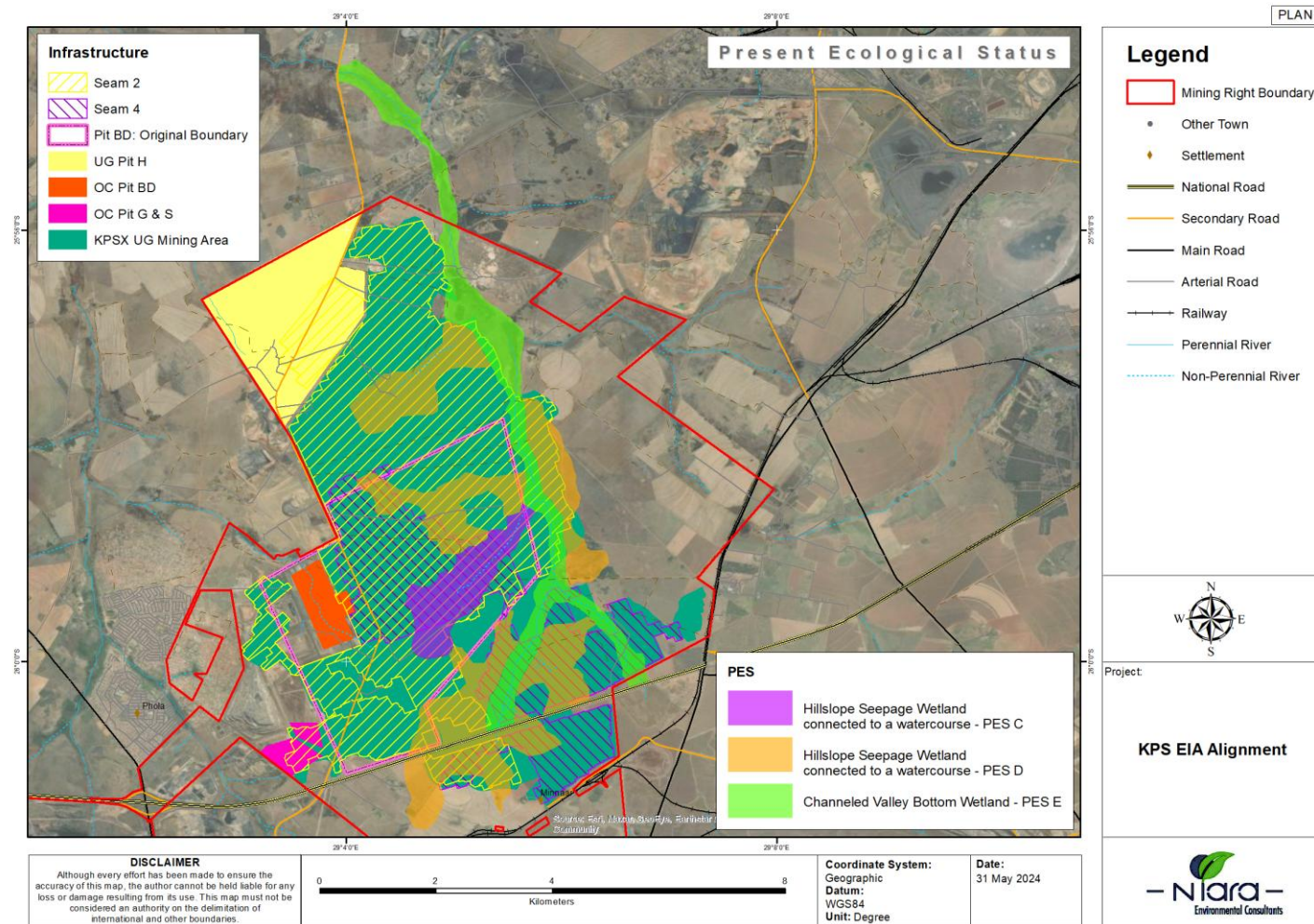


Figure 5-26: Map illustrating the results of the PES assessment of the identified wetland areas within the project area

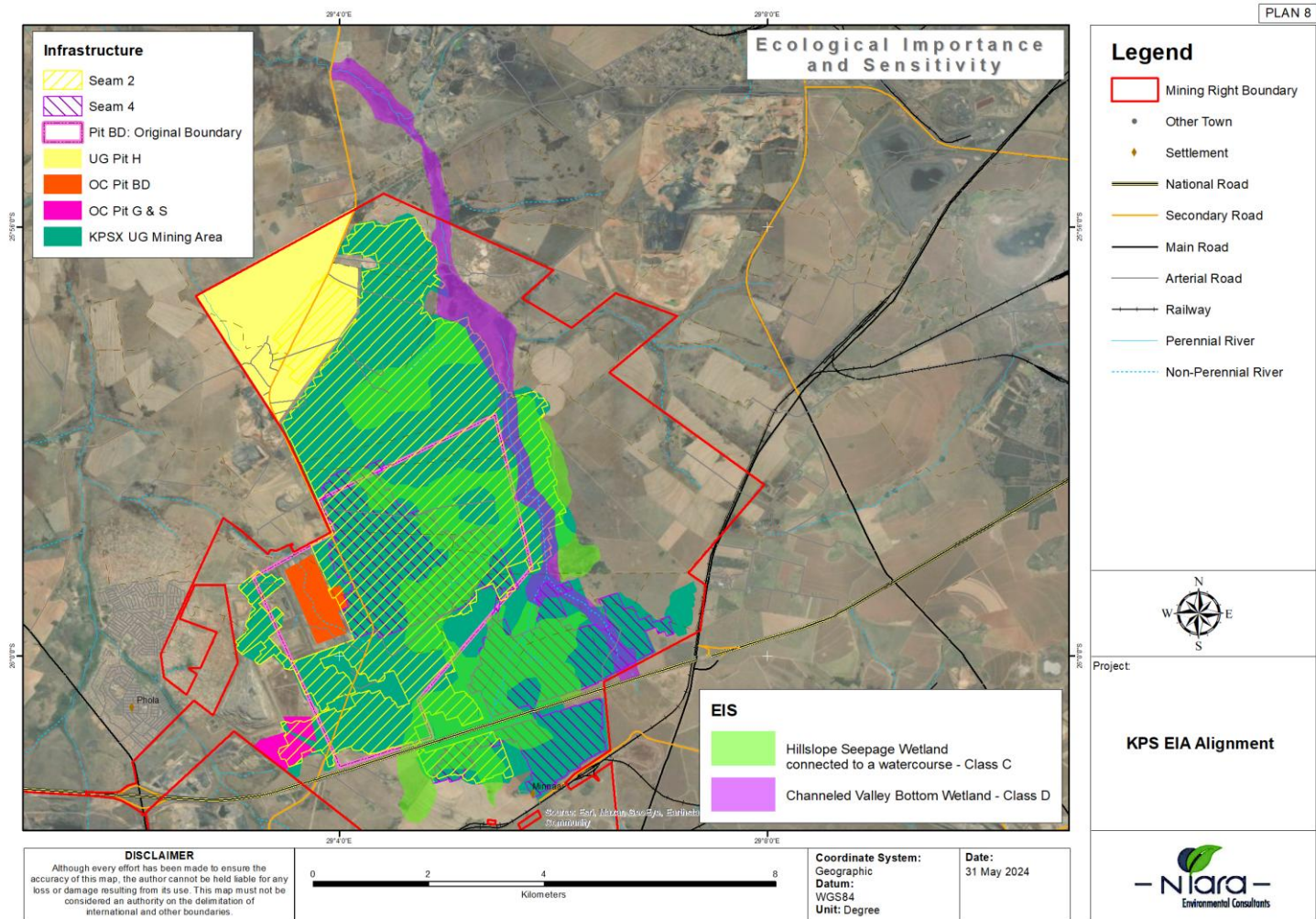


Figure 5-27: Map illustrating the results of the EIS assessment

### 5.7.3 Ecosystem Services Assessment Findings

The ecosystem services provided by the identified wetland areas within the project area were assessed and rated using the WET-EcoServices method (Kotze, et al. 2009). The summarised results for the wetland are shown in below Table 5-24.

Numerous functions are typically attributed to wetlands, which include nutrient removal (and more specifically nitrate removal), sediment trapping (and associated with this is the trapping of phosphates bound to iron as a component of the sediment), stream flow augmentation, flood attenuation, trapping of pollutants and erosion control. Many of these functions attributed to wetlands are wetland type specific and can be linked to the position of wetlands in the landscape as well as to the way in which water enters and flows through the wetland. Thus, not all wetlands can be expected to perform all functions, or to perform these functions with the same efficiency. Wetlands of the same type and located within the same general landscape setting are likely to perform the similar functions.

Seepage wetlands are typically maintained by shallow sub-surface interflow, derived from rainwater. Rainfall infiltrates the soil profile, percolates through the soil until it reaches an impermeable layer (e.g. a plinthic horizon or the underlying geology), and then flows laterally through the soil profile along the aquitard (resulting in the formation of a perched water table). The seepage wetlands are merely the surface expression of this perched water table in those areas where a shallow soil profile results in the perched water table occurring within 50cm of the soil surface. The hillslope seepage wetland systems within the project area are adjacent cultivated land and received surface run-off from the cultivated lands. These systems play a major role in sediment trapping, toxicant assimilation, nutrient removal mainly due to the extent of these systems within the project area. As shown in Table 5-24 sediment trapping, phosphate assimilation, nitrate assimilation and toxicant assimilation were classed as Moderately High. Stream augmentation and biodiversity maintenance were classed as High. Furthermore, some of the hillslope seepage wetland within the project area are classified as a NFEPA wetland with a 2 ranking. This is due to the biodiversity support role.

Channelled valley bottom wetland systems on site are expected to play an important role in biodiversity support. These wetlands provide a range of habitats, from temporarily wet, moist, to open water in channels and permanent depressions, which can accommodate a wide range of plant and faunal species. As these systems are also linear in nature, they have a significant role to play in maintaining corridors of natural vegetation through otherwise modified landscapes, allowing for the continued migration of species, as well as providing suitable foraging and breeding habitat for many species. As shown in Table 5-24, valley bottom wetlands scored the higher in the provision of ecological services within the project area.

**Table 5-24: The Eco-Services offered by the Hillslope Seepage Wetland onsite**

Wetland Functionality		HGM Units	
Ecosystem Services Supplied by each Wetland HGM Unit		Hillslope Seepage Wetland Connected to a Watercourse	Channelled Valley Bottom Wetland
Indirect Benefit	Regulating and Support	Flood attenuation	
		1.8	2.8

Wetland Functionality			HGM Units		
		Stream Augmentation	3.0	2.9	
		Water Quality Enhancement Benefits	Sediment Trapping	1.1	1.9
			Phosphate Assimilation	2.3	1.1
			Nitrate Assimilation	2.2	1.2
			Toxicant Assimilation	2.6	1.4
			Erosion Control	1.9	1.8
		Carbon Storage	1.2	1.6	
		Biodiversity Maintenance	1.9	2.8	
Direct Benefits	Provisioning Benefits	Provisioning of Water for Human Use	1.3	2.9	
		Provisioning of Harvestable Resources	1.2	1.7	
		Provisioning of Cultivated Foods	1.8	1.7	
	Cultural Benefits	Cultural Heritage	0.4	1.0	
		Tourism and Recreation	0.6	0.9	
		Education and Research	0.5	0.9	
<b>Overall</b>			<b>23.8</b>	<b>26.6</b>	

#### 5.7.4 Assessment of Impacts on the Delineated Wetlands

The wetland delineation was conducted with the aid of aerial imagery as well as a site visit conducted in February 2024. Findings indicate that two wetland hydro-geomorphic (HGM) units were identified within the proposed project area. The identified wetland HGM unit is classified as a hillslope seepage wetland connected to a watercourse as well as a channelled valley bottom wetland as indicated in the figure below. The identified wetland types are described below.

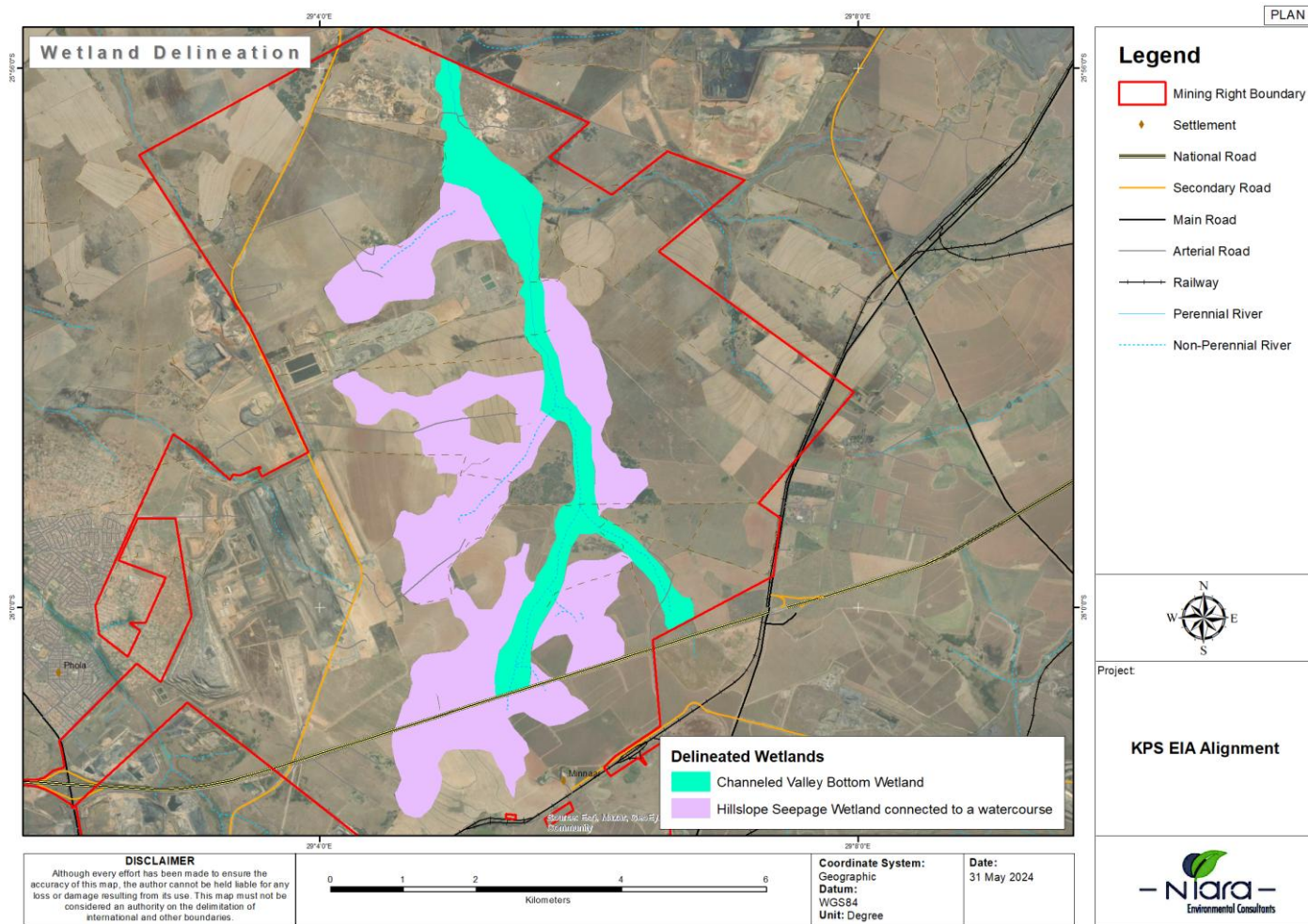


Figure 5-28: Map of the delineated wetland areas within the underground mining area

The required infrastructure is already in place except for additional ventilation shafts and rescue boreholes will be constructed in strategic areas as the mining advances for both KPSX and KPSS. In addition to the impacts listed, the wetland specialist assessment identifies the potential for decreased flow within watercourses due to groundwater drawdown associated with undermining of wetlands and watercourses and notes that groundwater–wetland interactions must be considered with reference to the hydrogeological and hydrogeological wetland and groundwater assessment. The strategic positions in which the additional ventilation shafts and rescue boreholes will be located have not been specified. The highest risk to the survival of the delineated wetlands during and post mining is the potential for subsidence as underground workings are expected to be located approximately 25m below the ground surface with a mining height cut-off at 1.5m. The risks associated with the Ongoing Operation as well as the Mine Closure and Decommissioning Phase of the proposed underground workings KPSX and KPSS are assessed in Table 5-25

Table 5-25: DWS Risk Impact Matrix.

Aspect	Pre-Mitigation				Proposed Mitigation Measures	Post-Mitigation			
	Consequence	Likelihood	Significance	Risk Rating		Consequence	Likelihood	Significance	Risk Rating
<b>Operational Phase</b>									
Discharge of decant water into the receiving wetlands	12	18	216	High	<ul style="list-style-type: none"> <li>No direct discharge of underground water into the wetland areas should take place;</li> <li>All removed underground water should be treated prior to release into the environment;</li> <li>The water discharge structure should be designed by a qualified engineer and must be designed as natural as possible as a bio retention pond with rock, topsoil and indigenous vegetation;</li> <li>A discharge structure maintenance plan must be implemented to include the discharge bio retention pond, erosion control measures, energy dissipators, water quality, vegetation and alien control.</li> <li>A comprehensive and appropriate environmental assessment and monitoring programme (including bio-monitoring, sediment sampling and ecotoxicology) to determine the impact, change, deterioration and improvement of the aquatic system must be implemented by the mine.</li> </ul>	8	11	88	Moderate
Degradation of wetland areas during drilling of the additional ventilation shafts and rescue boreholes	8	14	112	Moderate	<ul style="list-style-type: none"> <li>Existing access routes and disturbed areas should be utilised as far as possible to access planned borehole locations;</li> <li>Where no existing tracks are available, a single access track to each planned borehole location should be used;</li> <li>Access roads may not cross wetland channels or flow paths.</li> <li>Access tracks through wetland areas should be as short as possible and ideally run parallel to the contour (if possible) to limit the formation of preferential flow paths that could lead to erosion. Accessing planned borehole locations along tracks perpendicular to the contour should be avoided in steeply sloped areas.</li> <li>Set out of the planned borehole positions by using a hand-held GPS. The planned borehole position and proposed access route should be walked prior to machinery leaving existing roads and tracks. Saturated soils should be avoided as far as possible;</li> <li>Deviations from the planned access routes should be treated as an incident and should be properly investigated;</li> <li>Vegetation clearing should only be undertaken if absolutely necessary and should be limited to the smallest footprint possible, i.e. direct vicinity of the borehole.</li> <li>Where alien vegetation is cleared, all cuttings will be removed from site and appropriately disposed of appropriately;</li> <li>Rehabilitation of borehole and backfill of sumps. Material must be replaced in excavation in correct order, i.e., material excavated from the bottom of the sump must be replaced in the bottom of the sump and topsoil must be placed on surface.</li> <li>Machinery must leave planned borehole site along the same route used to access the planned borehole;</li> <li>Access route to be surveyed for vehicle ruts once machinery has left. Where ruts are deeper than 5cm have formed and remain following completion of geotechnical activities, these should be plugged with regular shallow soil berms to prevent preferential flow paths forming along the vehicle ruts.</li> </ul>	5	10	50	Low
Increased sedimentation due to stockpiles (Overburden), etc	11	11	121	Moderate	<ul style="list-style-type: none"> <li>Sediment traps and sediment barriers should be installed where necessary, and discharge points should be protected against erosion and incorporate energy dissipaters.</li> <li>To minimise the impact of increased runoff and sediment transport into adjacent wetlands, vegetation clearing and soil stripping should be minimised;</li> <li>Rehabilitation of disturbed areas should commence as soon as possible following disturbance to limit the period of time that bare soils are exposed;</li> <li>All disturbed areas should be landscaped to the natural profile, ripped in places where compaction has occurred and revegetated to limit unnatural flow impoundment or concentration, encourage infiltration of flows and limit the extent of exposed soils</li> </ul>	8	6	48	Low

Aspect	Pre-Mitigation				Proposed Mitigation Measures	Post-Mitigation			
	Consequence	Likelihood	Significance	Risk Rating		Consequence	Likelihood	Significance	Risk Rating
Pollution of water resources due to Acid Mine Drainage (AMD)	12	18	216	High	<ul style="list-style-type: none"> <li>The probability of acid mine generation should be established during the operational phase of the mine;</li> <li>Water quality should be regularly monitored and appropriate and timely remedial interventions made in the case of non-compliance.</li> <li>Ingress of surface water and exposure to oxygen should be limited;</li> <li>Treating of decanting mine/seepage water through the Klipspruit Colliery Water Treatment Plant should be considered. The level to which the water is treated should be determined in consultation with the DWA;</li> <li>Phytoremediation technologies should be investigated to address decant water as a long term solution post-closure of the mine;</li> <li>Any water released to the environment should meet relevant DWS water quality guidelines for aquatic ecosystem, recreational, livestock watering, irrigation and/or domestic water use;</li> <li>All Resource Quality Objectives (RQOs) relevant to water quality of the water resource as established in the document "Proposed Reserve Determination of Water Resources for the Upper Vaal Catchment" (DWS, 2018) should be adhered to;</li> <li>The chemical nature, timing, location and volumes of decant that is expected to occur post mining should be determined to allow more detailed decisions to be made regarding possible mitigation and management measures to be implemented;</li> </ul>	12	14	168	Moderate
Pollution of water resources due to hydrocarbon spills.	8	14	112	Moderate	<ul style="list-style-type: none"> <li>Care must be taken in the handling and storage of all drilling fluids, oils, greases and fuel on site, including all drilling vehicle and support vehicle fluids;</li> <li>Sufficient spill clean-up material must be kept on site at all times to deal with minor spills. All spills should be reported to the Environmental Officer and the relevant authorities (DWS) immediately, with specialists appointed to oversee the clean-up operations;</li> <li>No drilling equipment should be fixed on site. All malfunctioning drilling equipment must be moved designated workshop areas for fixing;</li> <li>No servicing or cleaning of vehicles/machinery to take place on site.</li> <li>No storage of fuel and diesel on site.</li> <li>Ensure that no equipment is washed in the streams and wetlands of the area, and if washing facilities are provided, that these are placed no closer than 100m from a wetland or water course;</li> <li>No abstraction of water from the wetlands or any of the river systems draining the study area for drilling purposes;</li> <li>In order to reduce the potential impacts associated with the introduction of contaminants dissolved or suspended in the runoff from drilling, where practically possible, no runoff should be introduced into wetlands directly;</li> <li>Any incident that may cause pollution of any water resource must immediately be reported to the relevant authorities as per the NEMA Section 30 incident report process.</li> <li>Pollution incidents must be dealt with in accordance with Section 19 and 20 of the National Water Act.</li> <li>All Resource Quality Objectives (RQOs) relevant to water quality of the water resource as established in the document "Proposed Reserve Determination of Water Resources for the Upper Vaal Catchment" (DWS, 2018) should be adhered to;</li> </ul>	4	8	32	Low
Establishment and spread of alien vegetation	10	15	150	Moderate	<ul style="list-style-type: none"> <li>Bush clearing and excavation of sumps adjacent to drill location. Vegetation clearing should only be undertaken if absolutely necessary and should be limited to the smallest footprint possible, i.e. direct vicinity of the borehole;</li> <li>Where alien vegetation is cleared, all cuttings will be removed from site and appropriately disposed of.</li> <li>An alien vegetation management plan should be compiled by an ecologist during the operational phase of the mine and should be kept in place for several years following mine closure (minimum of five years);</li> <li>All species of alien invasive vegetation should be controlled and removed from site. No spread of alien vegetation into any wetlands or adjacent properties should be allowed;</li> <li>Vegetation clearing should only take place where necessary;</li> </ul>	4	6	24	Low
Subsidence	12	18	216	High	<ul style="list-style-type: none"> <li>No surface subsidence should be allowed to occur within wetland habitats. As such, it is recommended that a detailed subsidence risk assessment is undertaken to determine the likelihood of subsidence and the likely consequences of such subsidence on water resources and wetlands. The risk assessment should inform the mine plan and design.</li> <li>No high extraction mining should take place under those areas and habitats classed as sensitive or of high importance in the baseline study (all wetland habitat should be considered as sensitive).</li> <li>However, should subsidence occur, measures must be taken to ensure the continuation of, or if necessary, reinstate, the natural hydrology within the landscape.</li> </ul>	10	15	150	Moderate

Aspect	Pre-Mitigation				Proposed Mitigation Measures	Post-Mitigation			
	Consequence	Likelihood	Significance	Risk Rating		Consequence	Likelihood	Significance	Risk Rating
<b>Mine Closure and Rehabilitation Phase</b>									
Increased sedimentation due to stockpiles (Overburden), etc)	11	11	121	Moderate	<ul style="list-style-type: none"> <li>Sediment traps and sediment barriers should be installed where necessary, and discharge points should be protected against erosion and incorporate energy dissipaters.</li> <li>To minimise the impact of increased runoff and sediment transport into adjacent wetlands, vegetation clearing and soil stripping should be concentrated in the dry season as far as possible;</li> <li>Rehabilitation of disturbed areas resulting from closure activities should commence as soon as possible following disturbance to limit the period of time that bare soils are exposed;</li> <li>All disturbed areas should be landscaped to the natural profile, ripped in places where compaction has occurred and revegetated to limit unnatural flow impoundment or concentration, encourage infiltration of flows and limit the extent of exposed soils</li> </ul>	8	6	48	Low
Pollution of water resources due to acid mine drainage (AMD)	12	18	216	High	<ul style="list-style-type: none"> <li>The probability of acid mine generation should be established during the operational phase of the mine;</li> <li>Water quality should be regularly monitored and appropriate and timely remedial interventions made in the case of non-compliance.</li> <li>The mine should assess the possibility of installing and operating a water treatment plant (e.g. a reverse osmosis plant or semi-passive treatment facility to treat AMD), and especially the long-term feasibility of running such a plant through the operational phase to post-closure should also be investigated;</li> <li>Ingress of surface water and exposure to oxygen should be limited;</li> <li>Treating of decanting mine water to acceptable water quality levels can be achieved by the installation of a treatment plant, typically an RO plant (reverse osmosis). The level to which the water is treated depends on the use of the water after treatment, but should be determined in consultation with the DWA. As a minimum, treated water should meet the standards for use for livestock watering and irrigation. Water treatment plants are however very energy intensive, raising questions about the long-term viability of treatment plants as a solution to AMD, especially given the energy crisis in South Africa and South Africa's dependence on coal as a source of electricity. It is therefore important to ensure financial and logistical capacity for long-term maintenance of treatment or infrastructural requirements should this approach be adopted;</li> <li>Any water released to the environment should meet relevant DWS water quality guidelines for aquatic ecosystem, recreational, livestock watering, irrigation and/or domestic water use;</li> <li>All Resource Quality Objectives (RQOs) relevant to water quality of the water resource as established in the document "Proposed Reserve Determination of Water Resources for the Upper Vaal Catchment" (DWS, 2018) should be adhered to;</li> <li>The chemical nature, timing, location and volumes of decant that is expected to occur post mining should be determined to allow more detailed decisions to be made regarding possible mitigation and management measures to be implemented;</li> </ul>	12	14	168	Moderate
Establishment and spread of alien vegetation;	10	15	150	Moderate	<ul style="list-style-type: none"> <li>An alien vegetation management plan should be compiled by an ecologist during the operational phase of the mine and should be kept in place for several years following mine closure (minimum of five years);</li> <li>All species of alien invasive vegetation should be controlled and removed from site. No spread of alien vegetation into any wetlands or adjacent properties should be allowed;</li> </ul>	4	6	24	Low
Subsidence	12	18	216	High	<ul style="list-style-type: none"> <li>No surface subsidence should be allowed to occur within wetland habitats. As such, it is recommended that a detailed subsidence risk assessment is undertaken to determine the likelihood of subsidence and the likely consequences of such subsidence on water resources and wetlands. The risk assessment should inform the mine plan and design.</li> <li>No high extraction mining should take place under those areas and habitats classed as sensitive or of high importance in the baseline study (all wetland habitat should be considered as sensitive).</li> <li>However, should subsidence occur, measures must be taken to ensure the continuation of, or if necessary, reinstate, the natural hydrology within the landscape.</li> </ul>	10	15	110	Moderate

### 5.7.5 Cumulative Impacts

Cumulative impacts, as defined by the International Finance Corporation (IFC, 2013), encompass a wide range of effects occurring at varying spatial and temporal scales. These impacts result from the combined effects of multiple activities over time, which may individually be minor but collectively significant (Dutta et al., 2012). This includes impacts from similar types of projects developing sequentially or a mix of different projects affecting a shared resource. Despite extensive mitigation efforts, significant latent impacts on receiving wetland areas may persist. The proposed underground mining at KPSX and KPSS is anticipated to lead to several cumulative impacts, notably the;

- Degradation of wetland areas;
- Water quality deterioration within the catchment;
- Subsidence

The primary contributor to water quality degradation is anticipated to be acid mine drainage from underground mine workings, leading to pH reduction, increased salinity, elevated metal concentrations, and sulphates. These changes are expected to adversely affect aquatic biodiversity by diminishing sensitive species and promoting the dominance of more tolerant species.

## 5.8 Hydropedology

A comprehensive hydropedological study conducted to assess the water and soil interaction at the project site. The study was based on a site visit carried out on February 22, 2024, and a review of relevant previous studies. The report is attached in Appendix F. The hydropedological assessments were made under the assumption that the current soil morphology corresponds to the existing soil water regime, understanding that any changes in land use or climate over time may gradually alter these conditions.

Terrain analyses were performed to identify dominant hillslopes reflective of typical terrain forms; however, it is acknowledged that there may be areas not fully represented by these hillslopes, which could exhibit different hydropedological behaviors. The Soil and Water Assessment Tool (SWAT) model used in this study primarily focuses on surface processes and does not encompass groundwater recharge dynamics, which should be evaluated within a broader landscape and drainage context.

The model's spatial representation within each sub-catchment is limited, potentially neglecting flow and pollutant routing between Hydrologic Response Units (HRUs). Additionally, the weather generator data used, particularly for precipitation, may not be entirely accurate due to the lack of measured weather data, leading to potential inaccuracies in model outputs.

Despite these limitations, the methodologies and procedures applied during sampling and analysis are consistent with established practices in the soil science community.

### 5.8.1 Field Survey and Soil Classification

. The hydropedological assessment was done February 2024 and the slopes within the project area were assessed. The soil forms (types of soil) found were described using the South African Taxonomic Soil Classification System (Soil Classification Working Group,

2018). Soil diagnostic horizons were used to classify the soil forms as well as hydropedological units namely recharge-, interflow- and responsive soils.

## 5.8.2 Identification of Hydrological Soil Types

Soil forms identified on site were regrouped into various hydrological soil types according to van Tol and Le Roux, 2019 as indicated in Table 5-26. The flow paths from the crest of a slope to the valley bottom is assessed and classified. According to Le Roux, *et al.* (2015), the classification largely considers the flow drivers during a rainfall event and the associated flow paths of water through the soil.

**Table 5-26: Hydrological Soil Types of the Studied Hillslopes (van Tol and Le Roux, 2019)**

Hydrological soil type	Description
<b>Recharge</b>	Soils without any morphological indication of saturation. Vertical flow through and out of the profile into the underlying bedrock is the dominant flow direction. These soils can either be shallow on fractured rock with limited contribution to evapotranspiration or deep freely drained soils with significant contribution to evapotranspiration
<b>Interflow (A/B)</b>	Duplex soils where the textural discontinuity facilitates build-up of water in the topsoil. Duration of drainable water depends on rate of evapotranspiration, position in the hillslope (lateral addition/release), and slope (discharge in a predominantly lateral direction).
<b>Interflow (soil/bedrock)</b>	Soils overlying relatively impermeable bedrock. Hydromorphic properties signify temporal build of water on the soil/bedrock interface and slow discharge in a predominantly lateral direction.
<b>Responsive (shallow)</b>	Shallow soils overlying relatively impermeable bedrock. Limited storage capacity results in the generation of overland flow after rain events.
<b>Responsive (saturated)</b>	Soils with morphological evidence of long periods of saturation. These soils are close to saturation during rainy seasons and promote the generation of overland flow due to saturation excess.
<b>Stagnating</b>	Soil's outflow of water is limited or restricted. The A and/or B horizons are permeable but morphological indicators suggest that recharge and interflow are not dominant. These soils are observed in regions with a high evapotranspiration and the dominant hydrological flow path in the soil is upward, driven by evapotranspiration.

## 5.8.3 Pit H – Hydropedological Assessment

### 5.8.3.1 Soil Chemical Properties

The soil pH was between 4.2 to 6.0, these soils are acidic to slightly acidic and the pH below 7 may be due to the acidic nature of the parent material from which the soils were derived and leaching of the nutrients. Calcium, and magnesium concentrations were generally low to moderate. Sodium levels ranged from 4 to 6mg/kg, levels below 200mg/kg are tolerable to plant growth and development when compared to soil fertility guidelines. Soil dispersion is unlikely to occur and cause dense structure and drainage problems (de Villiers *et al.*, 2003).

The Hutton and Clovelly soils are classified as a recharge soil due to the presence of a red apedal and yellow brown as the subsoil, respectively and absence of redox and reduction morphology as signs of periodic or permanent saturation. The lack of redox morphology at the deep saprolitic subsoil horizon indicates that the water that infiltrates the soil moves through the re horizon will not stagnate for prolonged periods but will infiltrate the underlying rock recharging laterally movement in rock fractures and/or the regional

groundwater. Orthic A horizons had higher values of Ca, Mg and S, when compared to red apedal B and yellow-brown B horizons. A decrease of the values in the subsoil might be due to leaching of cations downward.

Longlands and Fernwood soils are classified as interflow (A/B) and interflow (soil/bedrock), respectively. E horizons formed in soils by reduction and eluviation are an indicator of subsurface lateral flow (SLF) between the A and B horizons. Mottling in the E horizon is associated with a "fluctuating" water table indicating a more stagnant condition. These soils had low to moderate values of Mg, Ca and S, and the E horizon has redox morphology, indicating an extended duration of drainable water expected to contribute to lateral flow.

### 5.8.3.2 Soil Hydraulic Conductivity and Bulk Density

Bulk density is one of the sensitive soil quality indicators which assists to assess the eases of root penetration, water movement and soil strength (Nyambo *et al.*, 2018). A low BD results in poor soil-root interplay or contact, whereas a high BD decreases aeration and increases soil compaction (Lampurlanes *et al.*, 2003). Soils with high bulk density and low porosity have a negative influence on saturated hydraulic conductivity (Ks) and infiltration rate. Soils sampled had a bulk density ranging between 1,4 to 1,8g/cm<sup>3</sup>. As porosity increases, the dry weight decreases causing low bulk density. Soils were continuously ploughed which led to lose soil organic matter (SOM) and resulted to the degradation of soil aggregation. As a result, pores created during ploughing are unstable and readily collapse (Osunbitan *et al.*, 2005) due to greater slaking and dispersion of soil aggregates and consequently bulk density increases (So *et al.*, 2009). Saturated hydraulic conductivity is a function of the soils macroporosity and pore connectivity (Osunbitan *et al.*, 2005). Soils had slightly higher hydraulic conductivity.

The soils can be described as sandy loam, loamy sand, and sand, and sand was the dominant particle in all the soils. Sand holds little water, but gives it up to plants easily, whereas clay holds a lot of water, but it can be held tightly within the clay structure and be more difficult for plants to extract. Due to the texture and structure inherent in these soils, compaction within the "A" horizon is likely to occur if heavy machinery is used during the wet summer months over the unprotected ground, while the sensitivity of the soils to erosion is a factor to be considered during the rehabilitation process.

### 5.8.3.3 Hillslope Hydrology

The hydropedological survey shows that recharge soils (deep) are dominant on crest and midslope which ensures infiltration through the profile and into the bedrock layer. These soils will then recharge groundwater aquifers/wetlands in the valley bottoms, interflow (A/B) soils on lower midslope and interflow (Soil/berdock) soils in the valley bottom:

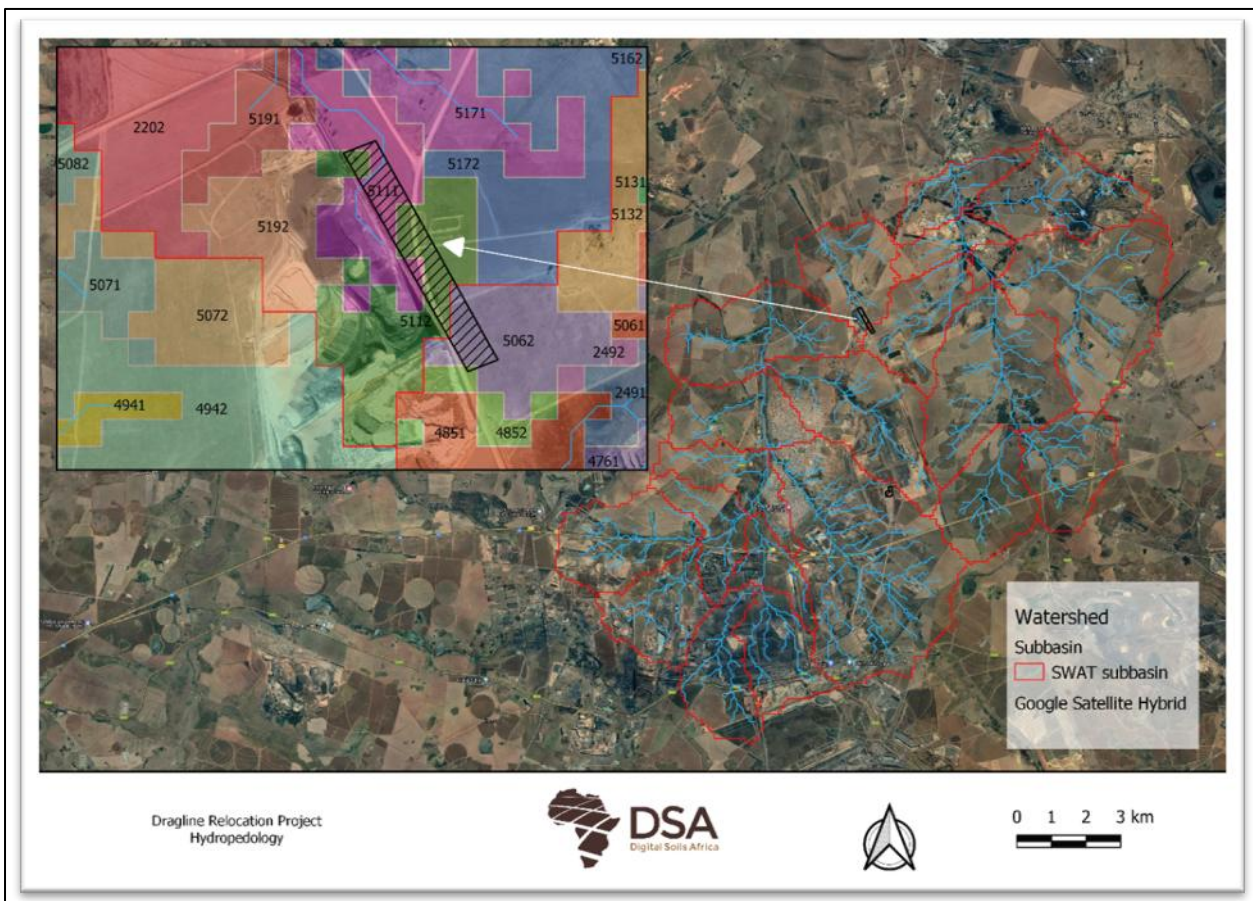
- Recharge soils are characterised by absence of any morphological indication of saturation and are typically associated with deep freely drained soils. The dominant hydrological pathway for these soils is vertical through and out of the profile. These soils are termed recharge soils, as they are likely to recharge groundwater, or lower lying positions in the regolith via fractured bedrock.
- On the lower midslope positions, besides rain, soils indicate periodic saturation at the A/B horizon interface (typically expressed as E horizons) dominate. On site the interflow (A/B) were of the Longlands forms. Saturation occurs at the

soil/bedrock interface and can result in lateral flow. When the water level reaches the more permeable surface horizons lateral flow occurs at much faster rates at the A/B horizon interface. The lighter colour of the Albic horizon further supports that lateral flow dominates (Le Roux, *et al.*, 2015).

- Interflow (soil/bedrock) is dominant after interflow (A/B). The flow in these soils occurs due to the build-up of water on relatively impermeable bedrock. Freely drained soils and hydromorphic properties signify periodic saturation associated with a water table at the soil bedrock/interface.

#### 5.8.3.4 Modelling

The hydrological model SWAT+ (v1.2.3) was used for the modelling with QSWAT+ (v1.2.2) to set up the watershed. SWAT+ is a revised version of the well-known Soil and Water Assessment Tool (SWAT) (Arnold *et al.*, 1998). SWAT is a widely used small watershed to river basin-scale model. It is typically used to simulate the quality and quantity of surface and ground water and predict the environmental impact of land use, land management practices, and climate change. The soil distribution patterns observed during the hydropedological survey were extrapolated to cover the area of the catchment, as illustrated in Figure 5-29.



**Figure 5-29: Subbasins Delineated used in the SWAT Model and the Landscape Units Surrounding the Pit Extension**  
Catchment area outside the soil surveyed used the dominant soil properties obtained from the Landtypes data (Land Type Survey Staff, 1972 – 2002). Hydraulic parameters were derived from the laboratory analysis results of the dominant soil horizons. A 12-year

simulation period was selected (1<sup>st</sup> January 1998 – 31<sup>st</sup> December 2009). Climatic data for this period was obtained from the Climate Forecast System Reanalysis (CFSR, 1979 – 2014) project done by the National Centres for Environmental Prediction (NCEP) (Saha *et al.*, 2010). WeatherGen in SWAT+ Editor used daily precipitation, temperature (minimum and maximum, wind speed, solar radiation, and relative humidity from selected stations to generate daily climatic variables for the simulations. The daily precipitation was adjusted so that the annual rainfall was comparable with the measured rainfall for the site. The model was allowed 2 years to settle, leaving a 10-year evaluation period. Results are reported only as yearly averages and a wet and dry month for the affected hydrological response units (HRUs) and the entire catchment.

### 5.8.3.5 Results

The modelling results are presented at two different scales to understand the hydrological processes. At the basin scale, the processes that contribute to the five subbasins are presented, while at the HRU scale, the flowpaths of the soils in the study are analysed. The modelling results for the subbasins are presented as the annual average to gauge the general flowpaths in the basin (Table 5-27). Evapotranspiration (ET) accounts for a significant portion of the water balance, which is expected from the climate of the site. Surface runoff is the most dominant process and accounts for most of most of the water balance in the annual average. This is expected due to transformed soils and mining impacts of the basin. The percolation is low considering that the area is dominated by deep freely draining soils which are classified as recharge soils. This is probably due to the mining in the area.

**Table 5-27: Modelling Results for the Entire Basin as the Annual Average**

	Annual Average	%Rain
<b>Rainfall</b>	809.0	
<b>Water yield</b>	378.9	47%
Surface runoff	378.5	47%
Lateral flow	0.4	0%
<b>Percolation</b>	25.4	3%
<b>ET</b>	458.3	57%
Transpiration	114.2	14%
Evaporation	328.9	41%
<b>Soil Water</b>	138.7	17%
<b>PET</b>	1821.4	225%

A Landscape Unit in the SWAT+ model initially distinguishes between upslope and floodplain LSU based on the terrain position. The upslope LSU is an area with similar soil type and landcover, thereby being comparable to a hillslope. Typically, two or more LSUs contribute as a source to the Floodplain LSU (wetland).

The LSU's impacted by the operations are one floodplain LSU (5111) and the contributing upslope LSUs are 5192,5112, 5172 (Figure 5-29). Large portions of LSU 5192 and 5112 have been mined already and therefore their contributions to the wetland are limited. Since large impacts already exist, modelling a scenario before the expansion will not yield meaningful insights. Therefore, an

approach to understand the remaining contributing LSU to the wetland was followed. LSU 5172 is unmined, and the proposed expansion does not fall into the LSU, and will be the dominant source of water, and therefore the focus of the modelling results. Three annual rainfall scenarios, namely, average, lowest and highest annual rainfall for the simulation period, will be used to identify flowpaths and discuss the drivers of the wetland.

The LSU 5172 consists of Bb13 Landtype, which was represented in the model by the Bainsvlei and Avalon soil forms. These soils consist of an orthic A, red or yellow brown apedal B overlying a soft plinthic B horizon. The average depth for the area was 930 mm, but the soft plinthic horizon (low Ksat) occurs within 600 mm. Generally, these soils are associated with interflow both in the soft plinthic and above the soft plinthic when the apedal horizon is saturated. The selected results discussed from the model are presented in Table 5-34.

**Table 5-28: The Annual, Average, Driest Year and Wettest Year During the Simulation Period for LSU 5172**

	Annual Avg (mm)	%Rain	2004	%Rain	2006	%Rain
<b>Rainfall</b>	809.0		217.4		1297.1	
<b>Water yield</b>	163.3	20%	4.7	2%	325.5	25%
Surface runoff	163.0	20%	4.7	2%	325.0	25%
Lateral flow	0.3	0%	0.0	0%	0.5	0%
<b>Percolation</b>	26.3	3%	2.5	1%	57.4	4%
<b>ET</b>	616.2	76%	216.6	100%	871.0	67%
Transpiration	138.4	17%	22.0	10%	280.3	22%
Evaporation	460.0	57%	190.8	88%	563.2	43%
<b>Soil water content</b>	87.5	11%	35.3	16%	156.2	12%
<b>PET*</b>	1821.4	225%	2070.0	952%	1632.0	126%
<b>Surface</b>	0.0	0%	0.0	0%	0.0	0%
<b>Lateral</b>	0.0	0%	0.0	0%	0.0	0%
<b>Surface channel</b>	112.5	14%	3.2	1%	224.2	17%
<b>Lateral channel</b>	0.0	0%	0.0	0%	0.0	0%

\*% Rain- Percentage of rainfall is not the water balance, but rather a reference for comparing different contributions.

The annual average rainfall for the simulation period was 809 mm. The evapotranspiration (ET) is high (76%), which is mostly evaporation from soil. This is an indication that high amounts soil moisture is available for evaporation. This is due to low infiltration rates into the soft plinthic horizon and therefore soil moisture is lost to evaporation because it within 600 mm of the surface where evaporation is the highest. The measured Ksat of the apedal horizons was lower than expected, and this will also contribute to the high ET. The soils have a moderate percolation (3%). The model predicts high surface runoff, which is not associated with apedal horizons. This is a result of the low Ksat measured on the site, which results in low infiltration and high overland flow.

The driest year in the simulation period was 2004, with an annual rainfall of 217.4 mm. The decrease in rainfall (less than the annual average) is only sufficient to satisfy the evaporation demand and, therefore, during dry periods very little flowpaths (overland, vertical, and lateral).

The wettest year in the simulation period was 2006, with an annual rainfall of 1297.1 mm. The evapotranspiration (ET) is lower than annual average but still high (67%). Percolation increases from annual average to 4 mm. The most notable difference is the increase in overland flow, which is expected with higher rainfall. The higher rainfall didn't induce interflow in the soils. The most likely reason being the low Ksat measured in the apedal B horizons.

The selected LSU results are contradictory to the morphological interpretations. The LSU consisted of Bainsvlei and Avalon soil forms. These soils consist of an orthic A, red or yellow brown apedal B overlying a soft plinthic B horizon. The average depth for the area was 930 mm, but the soft plinthic horizon (low Ksat) occurs within 600 mm. Generally, these soils are associated with interflow both in the soft plinthic and above the soft plinthic when the apedal horizon is saturated. The measured Ksat for the apedal horizons was very low for red and yellow brown apedal horizons (22.48 and 26.48 mm/h respectively). The predicted overland flow is a concern for erosion control. High volumes of overland flow are associated with erosion. Mitigation to seed the area with natural grass that will increase the infiltration rate into the soils. Deep rip the soils to increase the water holding capacity of the soils.

## 5.8.4 Results and Discussion

### 5.8.4.1 Land Types and Soils

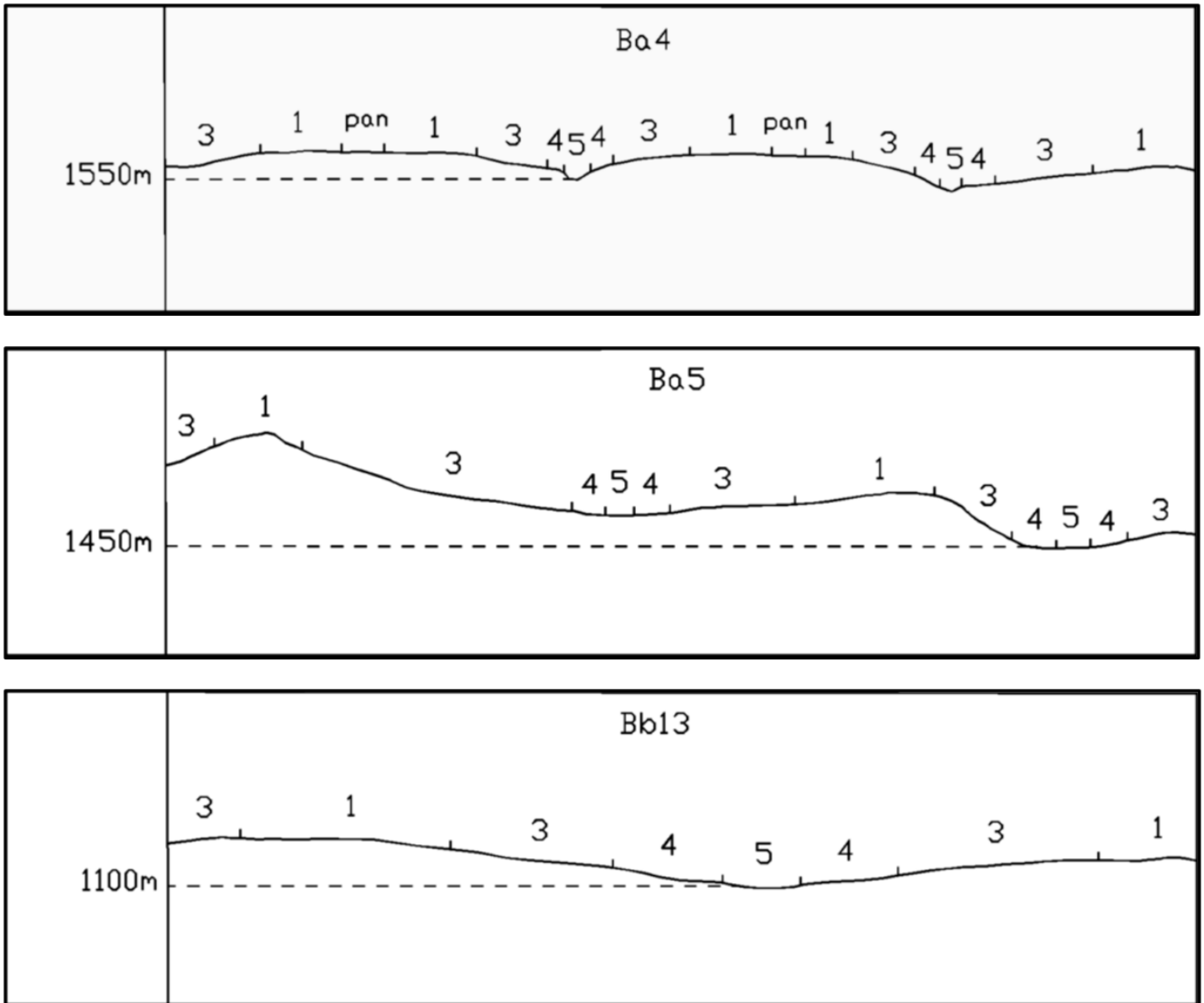
A land type survey on a scale of 1:250 000 was conducted in the early 1970s to compile inventories of the natural resources of South Africa in terms of soil, terrain, and climate. The land type indicates the dominant soil forms and their occurrence in terms of percentages. The study area comprises of land types of Ba4, Ba5 and Bb13 and presence of a plinthic catena dominates these land types, as illustrated in Figure 5-31. Land type Ba and Bb indicates land in which red and/or yellow brown apedal soils are dystrophic and/or mesotrophic, dominate over red and/or yellow-brown eutrophic soils. A plinthic catena that in its perfect sequence is represented by (in order from highest to lowest in the upland landscape crest, midslope and foot slope positions). Red well drained soils for example Hutton soil types, yellow Clovelly soils in the midslope landscape position and less well drained soil in foot slope and valley bottom positions such as the Fernwood and Longlands soil forms. In addition, shallow Glencoe and Dresden soils, underlain by hard plinthite, occur in some places within the landscape.

The Ba4 Land Type is dominated by 45% crest and 40% mid-slope terrain unit positions in the landscape. Other positions in the landscape are foot-slope and valley bottom positions occupying 10% and 5% of the landscape positions respectively see the representative terrain sketch, Figure 5-30. The Ba 4 Land type is dominated by deep well drained red/yellow brown apedal soils, and the following list of soil types occur within the crest position of this land type: Hutton, Avalon and Glencoe.

The Ba5 Land Type is dominated by 20% crest and 60% mid-slope terrain unit positions in the landscape. Other positions in the landscape are foot-slope and valley bottom positions occupying 15% and 5% of the landscape positions respectively see the representative terrain, Figure 5-30. The Ba 5 Land type is dominated by deep well drained red/yellow brown apedal soils, and the

following list of soil types occur within this land type in the crest of the landscape: Hutton, Clovelly, Avalon and shallow rocky soils (Mispah).

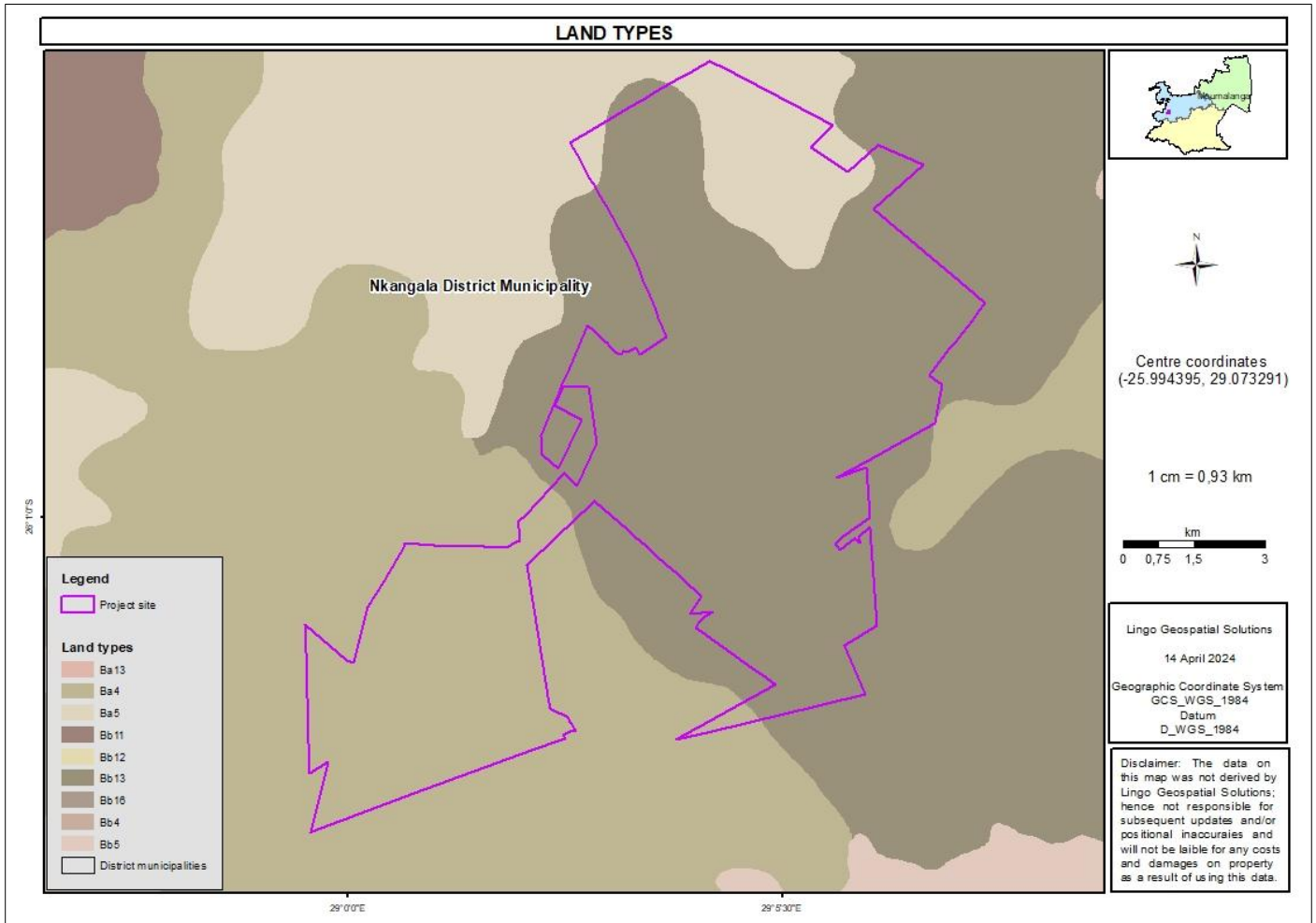
The Bb13 land type is, is dominated by 40 % crest and 45 % midslope positions, the remainder (15 %) is occupied by valley bottom landscape positions see the representative terrain form sketch, Figure 5-30. The Bb13 Land type is dominated by deep well drained yellow brown apedal soils, and the following list of soil types occurs within the crest in this land type; Clovelly, Avalon and shallow soils such as Mispah and Glencoe.



**Figure 5-30: Representative Terrain Form Sketch of Land Types**

The project site is dominated by the presence of high potential agricultural soils such as Hutton, Clovelly, Avalon soils; shallow soils such as Mispah and wetland soils such Fernwood and Longlands, Figure 5-32. Also, the project area has been transformed by the mining activities, Transported Technosols were observed. Materials intentionally transported by human intervention and already been

impacted by mining activities (open cast areas and stockpiles). The properties of these soil forms are affected strongly by the nature of the material or the human activity that placed it and they are more likely to be contaminated than soils from other groups.



**Figure 5-31: Land Types in the Vicinity of the Project Area**



**Figure 5-32: Examples of the identified soil forms: A) Hutton (Red apedal), B) Clovelly, C) Longlands, D) Avalon, E & F) Wetland soils (Albic & G)**

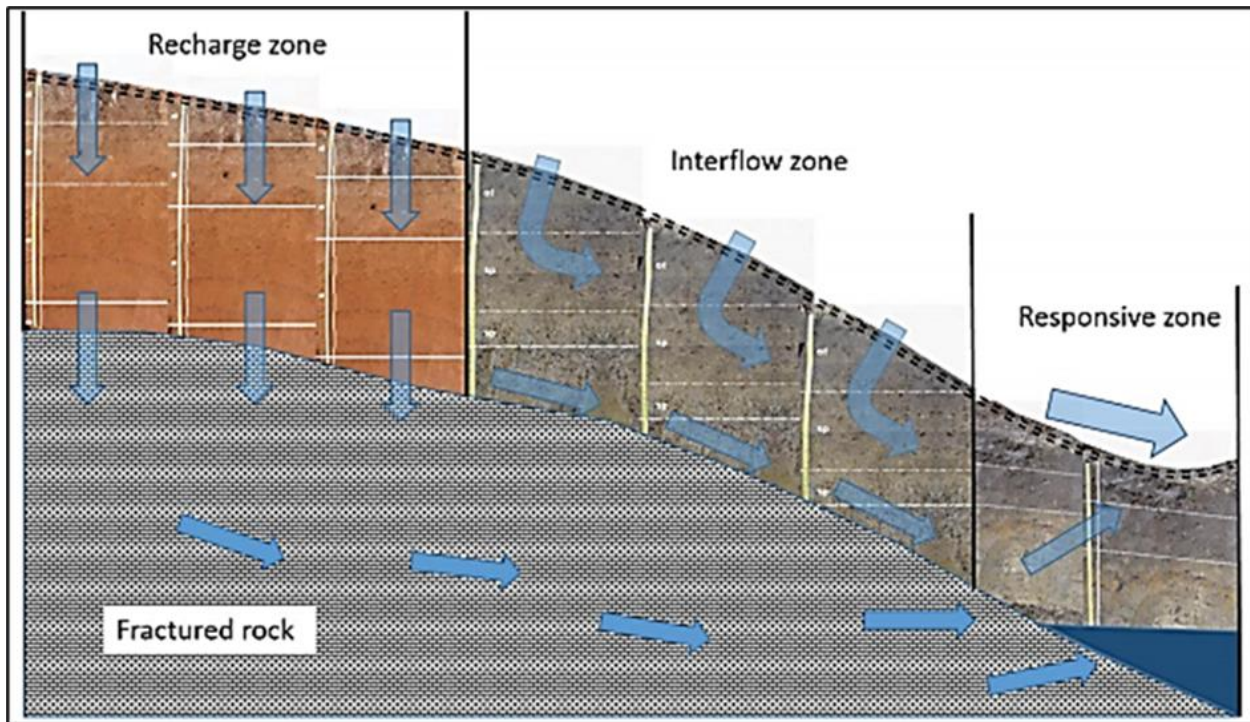
#### 5.8.4.2 Current Land Use, Surrounding and Historical

Results from the field soil survey (soil form and depth) and analysis (selected chemical and physical parameters), as well as observations made on site, will be used to inform the potential and realistic land uses for the area. The most dominant land uses within the project are mining activities (Coal) and the other land uses on the site are crop production mainly maize and soybeans. Surrounding land use can be broadly defined as arable land under cultivation on commercial farms (Dryland and Pivot Irrigated) and open cast mining.

#### 5.8.4.3 Hillslope Hydrology

In South Africa, hydrogeological classification of soils are based on defining the hydrological function of soils within a hillslope (van Tol *et al.*, 2013). The pedological soil forms are typically associated with soil water regimes. The soil form along with the soil hydromorphic signatures and can be used to infer soil water flow dynamics. In work by van Tol (2019) the pedological soil forms have categorised according to their hydrogeological function in a hillslope. These categories were used to define the

hydropedological classification of the project area. Figure 5-33 illustrates a typical example of the hydropedological response of a hillslope. In the recharge zone, the dominant flow direction is vertical through the soil and into the fractured rock, from where it can recharge groundwater levels or downslope positions in the hillslope soils. Lateral flow at the A/B horizon interface or soil/bedrock interface dominate in the interflow zone. The responsive zone is fed by lateral flowing water from the interflow zone as well as via the bedrock from the recharge zone.



**Figure 5-33: A Typical Conceptual Presentation of Hydrological Flow Paths on Different Hydropedological Soil Types – Hillslope Hydropedological Behaviour (DSA, 2017)**

Soils were first classified in accordance with the Soil Classification System (2018) and were then regrouped into hydropedological soil types in accordance with van Tol & Le Roux (2019), as indicated in Table 5-29.

**Table 5-29: Regrouping of Soil Forms into Hydropedological Soil Types**

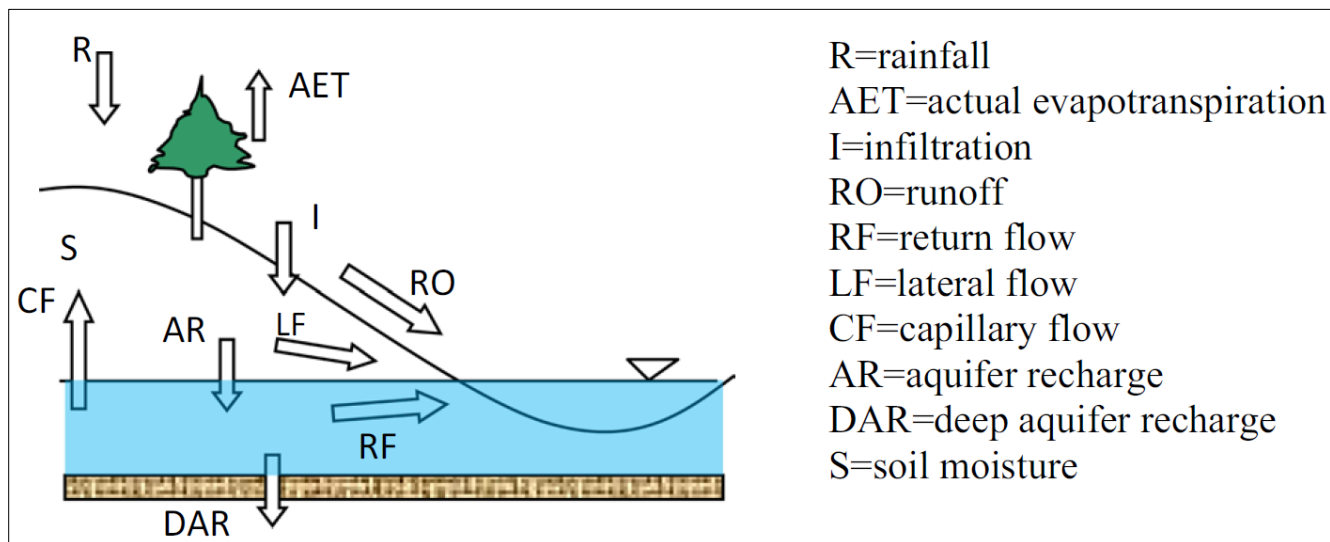
Soil Forms (Soil Classification Working Group, 2018)	Hydropedological Soil Type (van Tol & Le Roux, 2019)
Hutton	Recharge (Deep)
Clovelly	Recharge (Deep)
Avalon	Interflow (Soil/bedrock)
Longlands	Interflow (A/B Horizon)
Witbank	Recharge (Shallow)
Mispah	Recharge (Shallow)

Fernwood	Interflow (Soil/bedrock)
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### 5.8.5 Hydrological Modelling

SWAT is the acronym for Soil and Water Assessment Tool developed to predict the impact of land management practices on water, sediment and agricultural chemical yields in large complex watershed with varying soils, land use and management conditions over long periods of time. This is a physical model as it requires specific information pertaining to weather, soil properties, topography, vegetation and land management practices occurring in the watershed.

SWAT+ divides the catchment into landscape units (LSUs), which comprise of several similar hydrological response units (HRUs). An HRU is a homogenous area in terms of soils, land use, and slope. The model then calculates various components of the water balance, such as infiltration, overland flow, lateral flow, percolation, evapotranspiration, as well as discharge to the stream for each LSU and HRU. Figure 5-34 illustrates the conceptual water balance used in SWAT+.



**Figure 5-34: Schematic illustration of the conceptual water balance model in SWAT.**

The aim of the hydrological modelling was to quantify the dominant hydrological processes as well as the impact of the mining operation and all its existing water uses. Although modelling and reporting were undertaken on simulated percolation volumes, the impact of underground mining on groundwater resources is beyond the scope of this study. The catchment area was determined from a 30 m DEM and subdivided into 8 sub-basins, with 78 Landscape Units (LSUs) and 759 Hydrological Response Units (HRU's). The proposed development area (focus area) is limited to LSUs 210, 280, 390, 420, 596, 620, 630, 670, 860, and 940. These LSUs were consequently the focus of this modelling.

The current land use was obtained from the South African National Land-Cover Database (2013 – 2014) with predefined parameters for each of the uses. To simulate the impact of the development, the area associated with the current water use activities and the associated surface infrastructure was classified as virgin grassland areas before all the mining activities took place and post mining scenario (present state) the area under the development footprint was assigned a “mining barren”, “mine water” and “Mine buildings”.

**Table 5-30: Data used in the modelling process.**

Data	Scale	Source
Topography	30 m	The Shuttle Radar Topography Mission (SRTM)
Soil	30 m	In-situ and Land Type Data (Sorter Database).
Land use/Land Cover	30 m	South African National Land-Cover Database (2013 – 2014).
Climate	2 stations	Climate Forecast System Reanalysis (CFSR, 1979 – 2014).

The weather data was sourced from the Climate Forecast System Reanalysis (CFSR, 1979 – 2014) project done by the National Centers for Environmental Prediction (NCEP) (Saha *et al.*, 2010). From the obtained weather data, a 23 -year simulation period was selected (1<sup>st</sup> January 1998 – 31<sup>st</sup> December 2020). Numerous weather variables utilised for the modelling process were daily precipitation, temperature (minimum and maximum, wind speed, solar radiation and relative humidity from selected stations to generate daily climatic variables for the simulations. The data was given a 2-year warm up period before the simulation process can begin and thus leaving a 21-year evaluation period. Results are reported only as yearly averages for the affected HRUS, LSUs and the basin, before, and after the proposed development.

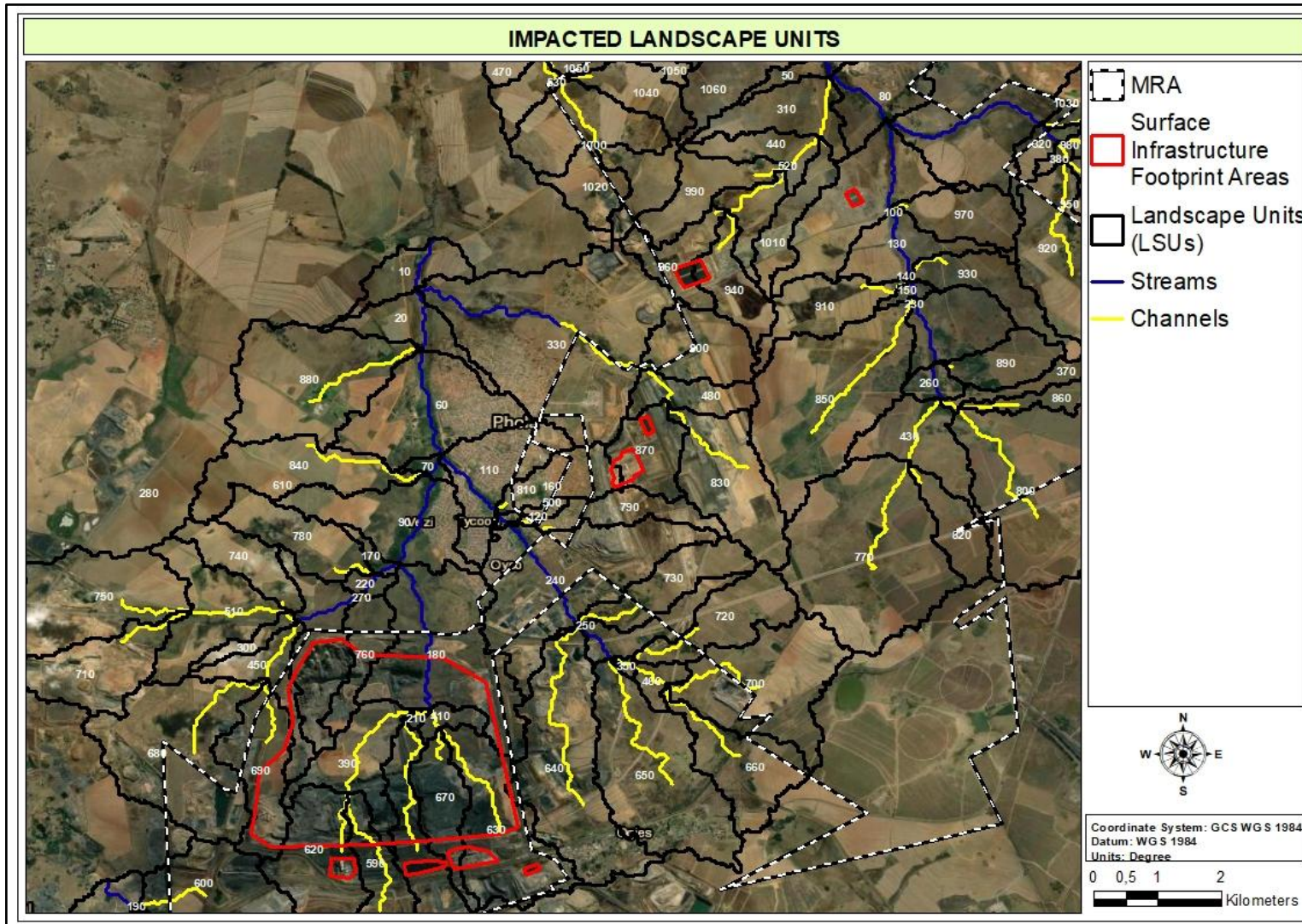


Figure 5-35: Landscape units associated with the catchment area.

## 5.8.6 Impacted HGMS, Basins, Landscapes and HRUs

### 5.8.6.1 Basin Scale

At the basin scale, the streamflow and surface runoff components increase by approximately 12% while accounting for 6.9% of the water balance. This can be attributed to the impermeable seal created across large areas of land surface by asphalt, concrete, and roof-topped structures associated with the mining-related infrastructure. These factors, in turn, impacted the interflow component, which decreased by 16.67%, as the sealed surface reduced the infiltration and thus impacted the subsurface interflow processes recharging the nearby water sources. The increase in percolation can be attributed to the presence of free-draining soils (Hutton and Clovelly) within the larger catchment, and the associated supporting surface infrastructure only constitutes a small portion of the MRA and catchment area. The reduction in evapotranspiration can be attributed to the removal of vegetation and placement of the surface infrastructure. However, evapotranspiration remains the dominant driver of the water balance, accounting for 91.13% of the water balance. The profile water decreases by 0.91% at this scale.

**Table 5-31: Summary of the water balance pre- and post-development at Basin scale.**

	Before	% of WB	After	% of WB	Change
<b>Rainfall</b>	458,918		458,921		
<b>Streamflow</b>	28,269	6,160	31,737	6,916	12,268
<b>Surface runoff</b>	28,268	6,160	31,737	6,915	12,269
<b>Lateral flow</b>	0,0003	0,0001	0,0002	0,0001	-16,667
<b>Percolation</b>	0,428	0,093	0,515	0,112	20,229
<b>ET</b>	418,223	91,132	415,634	90,568	-0,619
<b>e-canopy</b>	3,331	11,782	3,310	10,429	-0,628
<b>Transpiration</b>	19,281	4,202	19,237	4,192	-0,229
<b>Evaporation</b>	395,611	86,205	393,087	85,655	-0,638
<b>ET0</b>	1715,445		1715,443		
<b>Profile available water</b>	3,693		3,659		-0,919
<b>Topsoil available water</b>	2,197		2,168		-1,294

### 5.8.6.2 Landscape Unit Scale (LSU)

The LSU scale, which is equivalent to the hillslope scale, depicted an increase in both streamflow and surface runoff by 16.56% while accounting for 6.86% of the water balance. The lateral flow component decreased by 0.88%. Historical mining activities and the sealing of large ground surface areas with impermeable materials are likely to increase surface runoff and reduce the lateral flow components of the water balance. The model predicted an exponential increase in the percolation component of the water balance.

However, the contribution to the overall water balance is limited, with less than 1% contribution. Evapotranspiration remains the major driver of the water balance and accounts for 89.09% of the water balance, with major losses occurring through evaporation from bare soil because of the removal of vegetation for placement of mine infrastructure.

**Table 5-32: Summary of the water balance pre- and post-development at LSU scale.**

	Before	% of WB	After	% of WB	Change
Rainfall	458,921		458,921		
Streamflow	27,038	5,892	31,488	6,861	16,457
Surface runoff	27,038	5,892	31,488	6,861	16,457
Lateral flow	0,0003	0,0001	0,0003	0,0001	-0,881
Percolation	0,00007	0,00001	0,00051	0,0001	678,82
ET	409,917	89,322	408,844	89,088	-0,262
e-canopy	3,536	13,076	3,421	10,865	-3,234
Transpiration	19,690	4,291	19,200	4,184	-2,487
Evaporation	386,691	84,261	386,223	84,159	-0,121
ET0	1715,445		1715,443		
Profile available water	3,613		3,595		-0,489
Topsoil available water	2,149		2,126		-1,064

### 5.8.6.3 Hydrological Responsive Unit (HRU) Scale

At the finer scale, the activities occurring within the MRA and the surrounding areas within the watershed still increase both surface runoff and streamflow by 5.41%, while they account for 6.87% of the water balance. The Lateral flow component is expected to decrease by 5.44%, but however, they contribute less than 1% to the water balance. This still signifies the impact of the impervious surfaces and the flow path discontinuities experienced within the watershed. Evapotranspiration remains the major driver of the water balance as it accounts for 79.21%. The profile water increases by 2.17 at this scale.

**Table 5-33: Summary of the water balance pre- and post-development at HRU scale.**

	Before	% of WB	After	% of WB	Change
Rainfall	458,914		458,893		
Streamflow	29,923	6,520	31,540	6,873	5,405
Surface runoff	29,923	6,520	31,540	6,873	5,405
Lateral flow	0,0004	0,00008	0,0003	0,0001	-5,441

	Before	% of WB	After	% of WB	Change
Percolation	0,0005	0,0001	0,001	0,0001	3,953
ET	355,779	77,526	363,481	79,208	2,165
e-canopy	5,765	19,267	6,119	19,402	6,146
Transpiration	31,618	6,890	35,102	7,649	11,020
Evaporation	318,397	69,380	322,259	70,225	1,213
ET0	1715,445		1715,443		
Profile available water	2,990		3,055		2,176
Topsoil available water	1,797		1,834		2,073

Based on the outcomes, there will be minimal losses on the interflow processes due to the surface infrastructure, but the contribution to the overall water balance seems very low (<1%). So, no serious impacts are anticipated besides the increase in surface runoff, which can be dealt with through a stormwater management plan.

**Table 5-34: The Annual, Average, Driest Year and Wettest Year During the Simulation Period for LSU 5172**

	Annual Avg (mm)	%Rain	2004	%Rain	2006	%Rain
Rainfall	809.0		217.4		1297.1	
Water yield	163.3	20%	4.7	2%	325.5	25%
Surface runoff	163.0	20%	4.7	2%	325.0	25%
Lateral flow	0.3	0%	0.0	0%	0.5	0%
Percolation	26.3	3%	2.5	1%	57.4	4%
ET	616.2	76%	216.6	100%	871.0	67%
Transpiration	138.4	17%	22.0	10%	280.3	22%
Evaporation	460.0	57%	190.8	88%	563.2	43%
Soil water content	87.5	11%	35.3	16%	156.2	12%
PET*	1821.4	225%	2070.0	952%	1632.0	126%
Surface	0.0	0%	0.0	0%	0.0	0%
Lateral	0.0	0%	0.0	0%	0.0	0%
Surface channel	112.5	14%	3.2	1%	224.2	17%
Lateral channel	0.0	0%	0.0	0%	0.0	0%

\*% Rain- Percentage of rainfall is not the water balance, but rather a reference for comparing different contributions.

The annual average rainfall for the simulation period was 809 mm. The evapotranspiration (ET) is high (76%), which is mostly evaporation from soil. This is an indication that high amounts soil moisture is available for evaporation. This is due to low infiltration

rates into the soft plinthic horizon and therefore soil moisture is lost to evaporation because it within 600 mm of the surface where evaporation is the highest. The measured Ksat of the apedal horizons was lower than expected, and this will also contribute to the high ET. The soils have a moderate percolation (3%). The model predicts high surface runoff, which is not associated with apedal horizons. This is a result of the low Ksat measured on the site, which results in low infiltration and high overland flow.

The driest year in the simulation period was 2004, with an annual rainfall of 217.4 mm. The decrease in rainfall (less than the annual average) is only sufficient to satisfy the evaporation demand and, therefore, during dry periods very little flowpaths (overland, vertical, and lateral).

The wettest year in the simulation period was 2006, with an annual rainfall of 1297.1 mm. The evapotranspiration (ET) is lower than annual average but still high (67%). Percolation increases from annual average to 4 mm. The most notable difference is the increase in overland flow, which is expected with higher rainfall. The higher rainfall didn't induce interflow in the soils. The most likely reason being the low Ksat measured in the apedal B horizons.

The selected LSU results are contradictory to the morphological interpretations. The LSU consisted of Bainsvlei and Avalon soil forms. These soils consist of an orthic A, red or yellow brown apedal B overlying a soft plinthic B horizon. The average depth for the area was 930 mm, but the soft plinthic horizon (low Ksat) occurs within 600 mm. Generally, these soils are associated with interflow both in the soft plinthic and above the soft plinthic when the apedal horizon is saturated. The measured Ksat for the apedal horizons was very low for red and yellow brown apedal horizons (22.48 and 26.48 mm/h respectively). The predicted overland flow is a concern for erosion control. High volumes of overland flow are associated with erosion. Mitigation to seed the area with natural grass that will increase the infiltration rate into the soils. Deep rip the soils to increase the water holding capacity of the soils.

## 5.9 Exclusion of Biodiversity Impact Study

A biodiversity study was not required for the proposed expansion of Pit BD and the conversion of Pit H from opencast to underground mining. Niara has prepared a technical memorandum for the exclusion of a biodiversity study to provide an overview of the current site conditions concerning biodiversity. This memorandum is attached in Appendix C. The area, currently approved for opencast mining, was previously assessed and found to be largely monospecific with low biodiversity value. The shift to underground mining is expected to minimize direct impacts and reduce losses to vegetation and habitat.

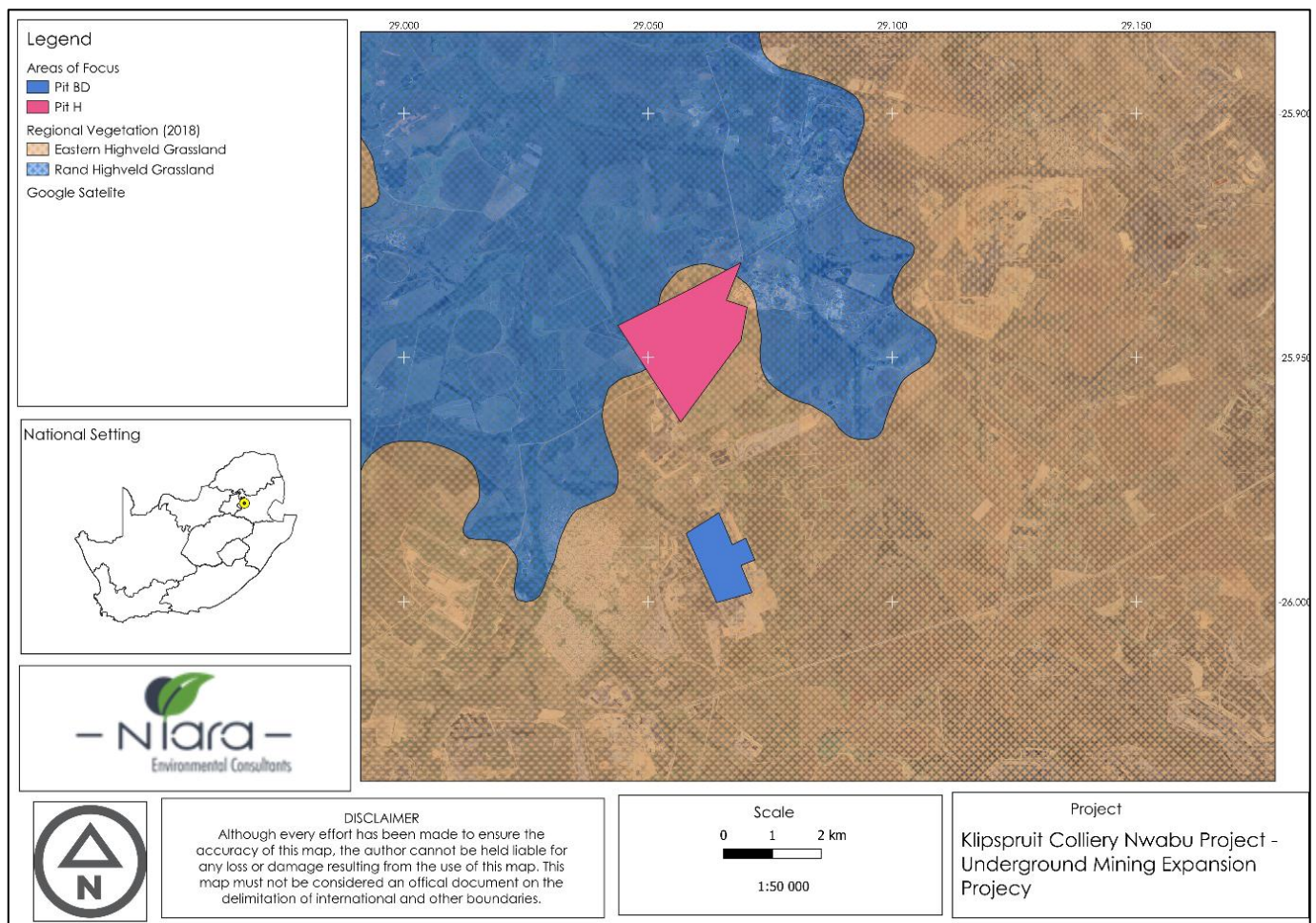
The regional vegetation occurring within the project area was the Eastern Highveld Grassland Vegetation unit as presented in Figure 5-36. The vegetation unit is found throughout the Mpumalanga and Gauteng provinces. The status of the vegetation, as at the time of publishing (2006), is summarised in Table 5-35 and the dominant plant species within the vegetation unit are shown in Table 5-36. This vegetation type occurs on moderately undulating planes, including some low hills and pan depressions. The vegetation is a short dense grassland dominated by the usual Highveld grass composition (*Arsitida*, *Digitaria*, *Erafrostsis*, *Themeda*, *Tristachya* etc.) with small scattered rocky outcrops with, wiry sour grasses and some woody species.

**Table 5-35: Vegetation Status**

Vegetation Name	Ecological Status	Conservation Status	% of Project Area
Eastern Highveld Grassland	Largely Modified	Endangered	100%

**Table 5-36: Dominant Plant Species**

Vegetation Unit	Dominant Plant Species
Eastern Highveld Grassland	<i>Andropogon shirensis</i> , <i>Cynodon dactylon</i> , <i>Eragrostis curvula</i> , <i>Eragrostis plan</i> , <i>Harpachloa falx</i> , <i>Aristida congesta</i> , <i>Sporobulus africana</i> , <i>Panicu, a natalense</i> , <i>Themeda triandra</i>



**Figure 5-36: The regional vegetation over the Areas of Focus (Pit H and Pit BD)**

The vegetation within the proposed project area was determined to be mostly secondary grassland on areas that were previously classified as agricultural crop fields as presented in Figure 5-36. Parts of the vegetation were dominated by dense *Digitaria eriantha*

grassland with good ground cover; however, very monospecific. Other parts were observed to be patchy grassland dominated by *Gomphocarpus physocarpus*. The grassland was largely unidentifiable as the grass species were in a poor condition as a result of seasonal changes and grazing (Figure 5-37). Furthermore, areas of bare soil were common throughout the area which indicates the degraded state of the vegetation.

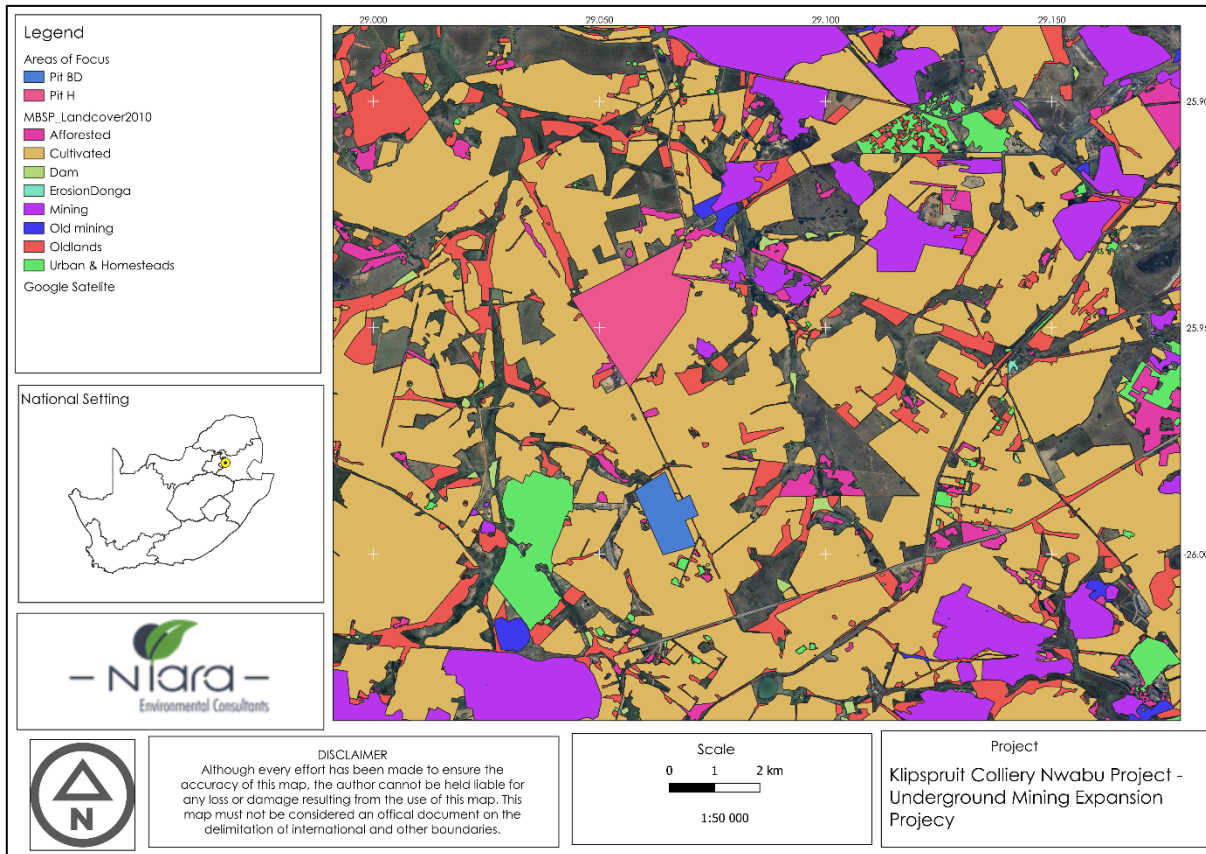


Figure 5-37: Land Cover over the proposed project area



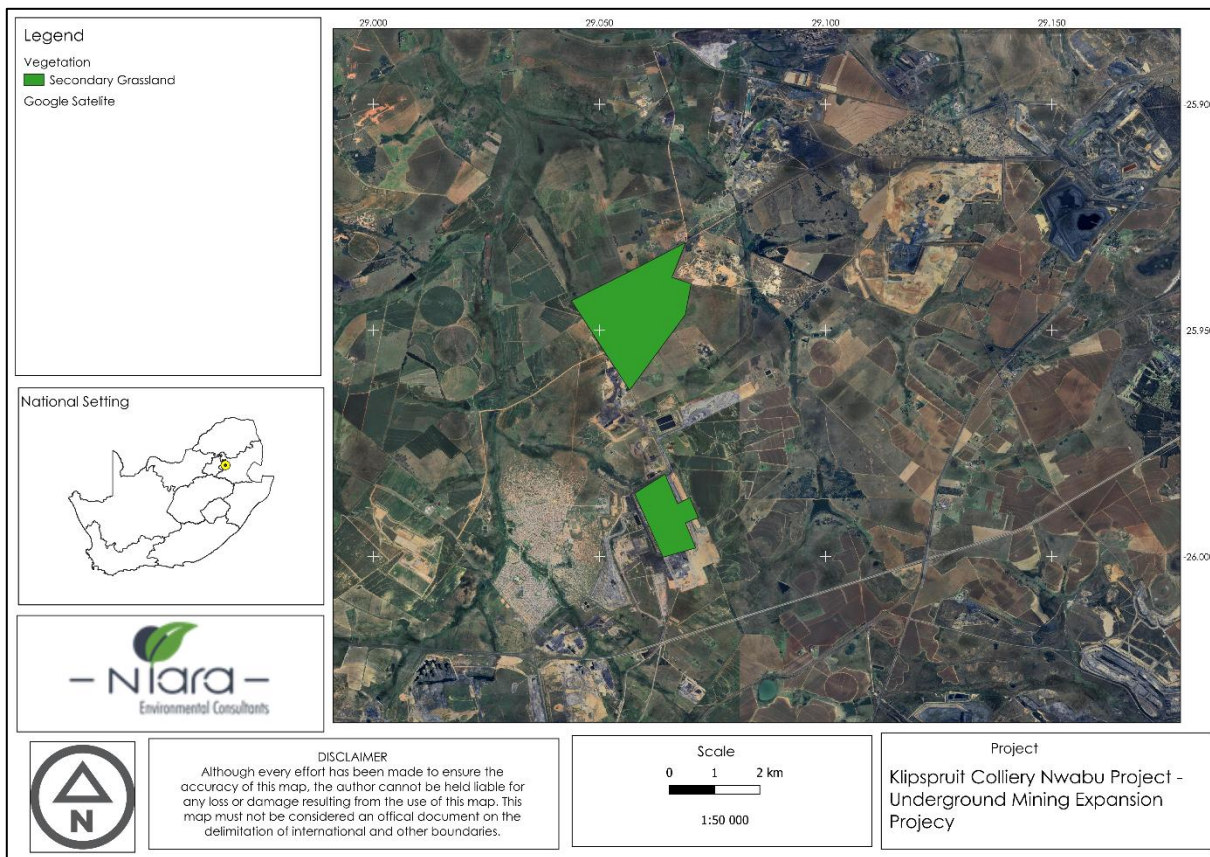


**Figure 5-38: Vegetation within the project area**

The plant species observed within the project area are listed in Table 5-40 . Some plant species were suspected based on the plant material available and the probability of occurrence. The dry season had commenced at the time of the assessment and the seasonal changes were evident with the loss of flowering parts on the majority of the floral species. No plant species of conservation concern were identified and the vegetation classified as secondary grassland (Figure 5-38).

**Table 5-37: Plant species observed in the project area**

Species Name	Common Name	Conservation Status
<i>Acacia mearnsii</i>	Black wattle	Category 1b invasive
<i>Bidens pilosa</i>	Black jack	
<i>Cynodon dactylon</i>	Couch grass	
<i>Digitaria eriantha</i>	Rhodes grass	
<i>Eragrostis curvula</i>	Weeping love grass	
<i>Gomphocarpus physocarpus</i>	Balloon plant	
<i>Seriphium plumosa</i>	Bankrupt bush	
<i>Solanum syssimbrifolium</i>	Wild tomato	Category 1b invasive
<i>Sporobolus africanus</i>	Rat's tail grass	
<i>Tagetes minuta</i>	Khakibos	
<i>Verbena bonariensis</i>	Purple top	Category 1b invasive



**Figure 5-39: The classification of the vegetation within the project area**

### 5.9.1 Impact Assessment- Surface Landscape, Vegetation, and Habitats

The transition from opencast to underground mining for Pit BD and Pit H at Klipspruit Colliery is anticipated to significantly alter impact ratings, particularly concerning habitat loss and disturbance. The previous impact assessment, which assumed complete mining of all vegetation and topsoil in the proposed expansion area, is now revised to reflect the reduced surface impact of underground mining.

#### Predicted Impacts

- 🌿 **Surface Landscape, Vegetation, and Habitats:** The new underground mining proposal will have minimal impact on the surface landscape, vegetation, and habitats compared to the original opencast mining plan.

#### Construction Phase Impacts

- 🌿 **Site Clearance for Infrastructure:**
  - Impact Without Mitigation: Low
  - Impact With Mitigation: Low
  - Status: Negative

- Reversibility: Irreversible
- Irreplaceable Loss: No
- Mitigation: Avoid sensitive areas and implement buffer zones to protect habitats.

### Operational Phase Impacts

#### Mining Operations and Access Roads:

- Impact Without Mitigation: Low to Moderate
- Impact With Mitigation: Low
- Status: Negative
- Reversibility: Partially reversible
- Irreplaceable Loss: No
- Mitigation: Effective management of operations to limit habitat disturbance.

### Decommissioning and post-closure

The decommissioning phase and post-closure impacts have not been detailed but will follow similar mitigation strategies to ensure minimal environmental disruption.

The conversion to underground mining methods is expected to significantly mitigate the biodiversity impacts originally assessed for the opencast mining proposal, thus presenting a more environmentally sustainable approach for the proposed expansion areas.

## 5.10 Water Quality

### 5.10.1 Groundwater quality

#### 5.10.1.1 Sampling Points

Table 5-38 and Figure 5-40 shows the sampling points that form part of the monitoring at Klipspruit Colliery. Twenty-nine groundwater points are currently being sampled for groundwater quality assessment.

**Table 5-38: Existing sampling points at Klipspruit Colliery.**

Site Name	Latitude	Longitude	Site Type
BSW 3	-26.033812	29.037752	Borehole
KGM 13	-26.052393	28.990923	Borehole
KGM B17	-26.047241	29.010828	Borehole
KGM B11	-26.04931	29.000103	Borehole
KGM B04	-26.025284	29.036629	Borehole
KGM B16			Borehole
KGM 08	-26.054552	28.991432	Borehole

Site Name	Latitude	Longitude	Site Type
KGM B06	-26.052101	29.040367	Borehole
KGM B07	-26.052158	29.019148	Borehole
KGM 10	-26.053146	29.039991	Borehole
KGM B09	-26.062178	29.010828	Borehole
BHP_P01	-26.0725	28.99565	Borehole
BHP_P02	-26.0558	29.04422	Borehole
BHP_P03	-26.0706	28.9966	Borehole
BHPW05	-25.98	29.107	Borehole
BHPW07	-25.985	29.047	Borehole
BHPW08	-25.944	29.056	Borehole
WELBH01	-26.026	29.056	Borehole
WELBH08	-26.012	29.05	Borehole
WELBH09	-26.021	29.04	Borehole
WELBH16	-25.956	29.05	Borehole
WELBH23	-25.93	29.069	Borehole
WELBH24	-25.941	29.087	Borehole
WELWEL03	-25.952	29.096	Borehole
WELWEL05	-26.057	29.086	Borehole

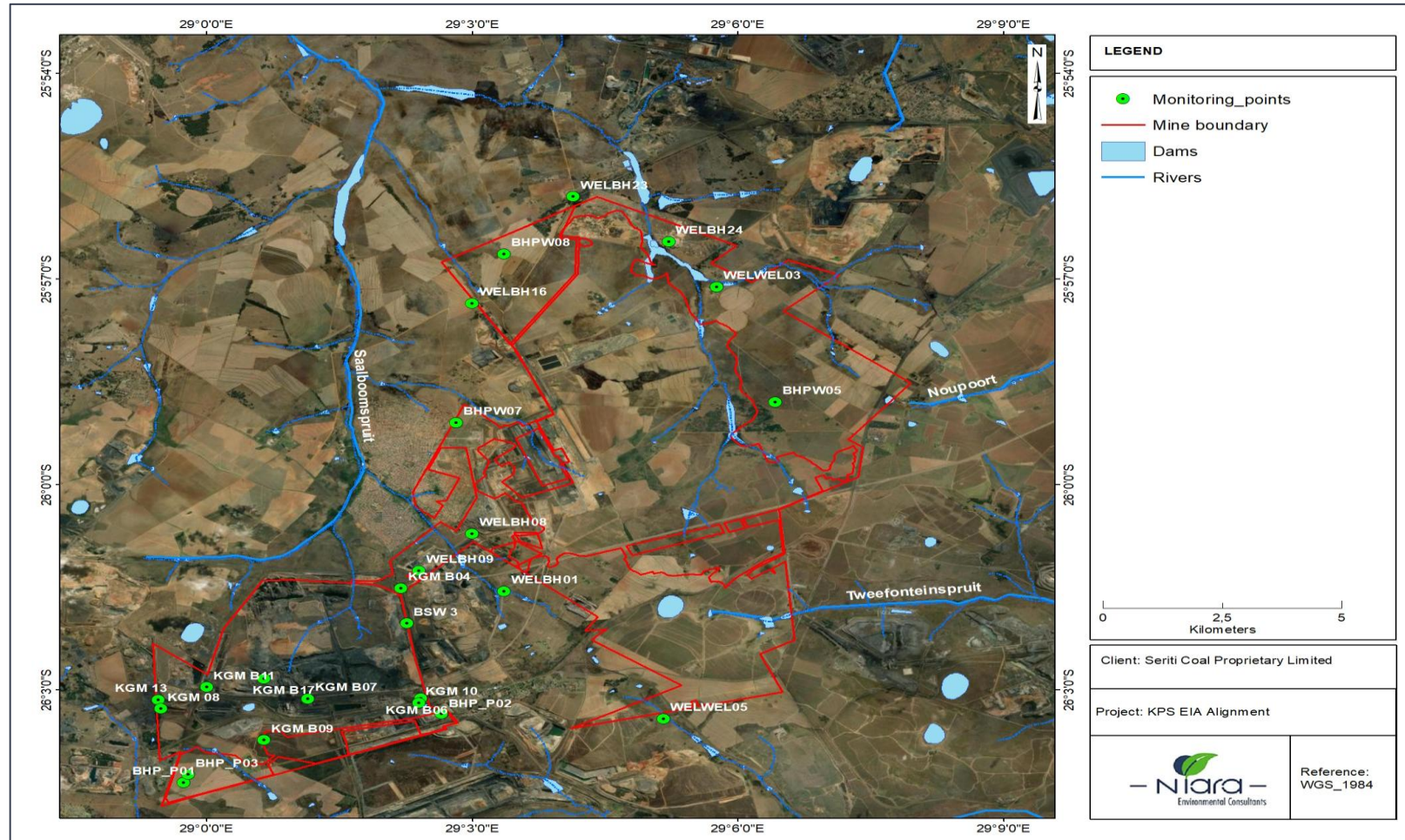


Figure 5-40: Distribution of sampling points

### 5.10.1.2 Parameters

Groundwater sampling and analysis is currently conducted by Aquatico. All samples collected are submitted to the Laboratory for the determination of all monitoring parameters. The following parameters form part of sampling and laboratory analysis for Klipspruit Colliery.

**Table 5-39: Monitoring parameters.**

Parameters	Parameters
pH	Na mg/l
EC mS/m	Al mg/l
TDS mg/l	Fe mg/l
TotHardness mg/l	Mn mg/l
MALK CaCO <sub>3</sub> /L	Zn mg/l
Cl mg/l	Si mg/l
SO <sub>4</sub> mg/l	SS mg/l
PO <sub>4</sub> mg/l	Turbidity NTU
N_Ammonium mg/l	Free Cl <sub>2</sub> mg/l
NO <sub>3</sub> -N mg/l	LSI (Index)
NO <sub>2</sub> -N mg/l	SAR
TON mg/l	CaHardness mg/l
F mg/l	MgHardness mg/l
Ca mg/l	Bicarbalk CaCO <sub>3</sub> mg/l
K mg/l	Carbalk mg/l
Mg mg/l	Halk mg/l

### 5.10.1.3 Water quality criteria

#### 5.10.1.3.1 Water use licence limits

Klipspruit Colliery have an authorised water use licence which contains water quality limits for selected parameters. The following table provides the parameters and WUL limits.

**Table 5-40: WUL limits.**

Parameters	Parameters
pH	Na mg/l
EC mS/m	Al mg/l
TDS mg/l	Fe mg/l
TotHardness mg/l	Mn mg/l
MALK CaCO <sub>3</sub> /L	Zn mg/l
Cl mg/l	Si mg/l
SO <sub>4</sub> mg/l	SS mg/l
PO <sub>4</sub> mg/l	Turbidity NTU
N_Ammonium mg/l	Free Cl <sub>2</sub> mg/l
NO <sub>3</sub> -N mg/l	LSI (Index)

Parameters	Parameters
NO <sub>2</sub> -N mg/l	SAR
TON mg/l	CaHardness mg/l
F mg/l	MgHardness mg/l
Ca mg/l	Bicarbalk CaCO <sub>3</sub> mg/l
K mg/l	Carbalk mg/l
Mg mg/l	Halk mg/l

#### 5.10.1.4 Water quality criteria

##### 5.10.1.4.1 Water use licence limits

Klipspruit Colliery have an authorised water use licence which contains water quality limits for selected parameters. The following table provides the parameters and WUL limits.

**Table 5-41: WUL limits.**

Parameters	Parameters
pH	8.79
EC mS/m	75.52
Cl mg/l	36.34
SO <sub>4</sub> mg/l	10.36
NO <sub>3</sub> -N mg/l	0.11
F mg/l	0.14
Ca mg/l	32.56
Mg mg/l	32.71
Na (mg/l)	44

##### 5.10.1.4.2 SANS Limits

Groundwater quality results were also compared to the South African National Standards for Drinking Water Quality (SANS 241; 2006 and 2015). Table 5-42 shows the SANS limit used for the assessment.

**Table 5-42: South African National Standards limits**

Parameters	Unit	Standard Limits
pH		5 - 9.7
EC	mS/m	≤ 170
TDS	mg/l	≤1200
Cl	mg/l	≤300
SO <sub>4</sub>	mg/l	≤500
	mg/l	≤250
N_Ammonium	mg/l	≤1.5
NO <sub>3</sub> -N	mg/l	≤11
NO <sub>2</sub> -N	mg/l	≤0.9
F	mg/l	≤1.5
Ca	mg/l	<150
	mg/l	150 - 300

Parameters	Unit	Standard Limits
K	mg/l	<50
	mg/l	50 - 100
Mg	mg/l	<70
	mg/l	70 - 100
Na	mg/l	≤200
Al	mg/l	≤0.3
Fe	mg/l	≤2
	mg/l	≤0.3
Mn	mg/l	≤0.4
	mg/l	≤0.1

#### 5.10.1.5 Water quality results compared to SANS Limits

Table 5-43 shows a statistical summary of groundwater quality at Klipspruit Colliery. The pH of groundwater samples generally ranges from 5.43 to 8.63. All samples are confined within the SANS limit of 5 – 9.7. The EC in groundwater is associated with the concentration of ionized substances, excessive hardness and contamination of groundwater. The EC of the groundwater samples of the mine ranges from 2.8 – 133.7 mS/m. This EC comply with the prescribed SANS limits of 170 mS/m. TDS in groundwater represents a range of dissolved parameters and consist of inorganic salts such as carbonates, bicarbonates, chlorides, sulphates, phosphates and nitrates of calcium, magnesium, sodium, potassium, and iron. TDS in groundwater samples varies from 24 – 1066 mg/l. All groundwater samples are well below guideline value of 1200 mg/l as prescribed by SANS.

The concentration of Cl, NO<sub>3</sub>, NO<sub>2</sub>, K, Na, Al, and Fe in groundwater samples collected at Klipspruit Colliery are confined within the regulatory limits defined by SANS. The concentration of K and Mg was fall under Class II of the SANS. Poor groundwater samples were noted in terms of SO<sub>4</sub>, NH<sub>4</sub>, F, and Mn. The concentration of these parameters exceeds limits in several boreholes. These samples are summarised as follows:

SO<sub>4</sub> – SO<sub>4</sub> was detected in high concentration in groundwater sample namely BSW 4. NH<sub>4</sub> was detected at high concentration in WELBH08 and BSW 4. The concentration of F exceeds guideline limits in WELBH27 and KGM 10. The concentration of Mn is above the SANS chronic health limits in BHPSM01, BHPW05, and WELBH16. Mn also exceed SANS aesthetic limits in BHPSM10, WELBH08, WELBH25, BSW 4, KGM13, and KGM B06. Detail chemical parameters compared with SANS limit is shown in Table 5-44.

**Table 5-43: Minimum and maximum water quality results**

Parameters	Unit	Minimum	Maximum
pH		5.43	8.63
EC mS/m	mS/m	2.8	133.7
TDS	mg/l	24	1066
MALK CaCO <sub>3</sub>	mg/l	3.64	290.666
Cl	mg/l	0.299	34.388
SO <sub>4</sub>	mg/l	0.146	646.897

Parameters	Unit	Minimum	Maximum
N_Ammonium	mg/l	0.007	8.118
NO3-N	mg/l	0.189	8.375
NO2-N	mg/l	0.006	0.188
F	mg/l	0.02	2.102
Ca	mg/l	0.93	151.554
K	mg/l	0.935	9.184
Mg	mg/l	0.596	90.236
Na	mg/l	1.47	145.592
Al	mg/l	-0.001	0.134
Fe	mg/l	-0.001	0.665
Mn	mg/l	-0.001	1.194

**Table 5-44: Water quality compared to SANS Limits.**

Site Name	Date Time	pH	EC mS/m	TDS mg/l	MALK CaCO3	Cl mg/l	SO4 mg/l	N Ammonium mg/l	NO3-N mg/l	NO2-N mg/l	F mg/l	Ca mg/l	K mg/l	Mg mg/l	Na mg/l	Al mg/l	Fe mg/l	Mn mg/l	
BH 008	2024/02/23 12:47	7.78	26.8	184	139.909	1.654	9.348	0.019	0.498	0.007	0.652	37.453	6.474	11.752	9.563	-0.001	-0.001	-0.001	
BH 009	2024/02/23 12:43	6.66	15.6	122	49.605	5.224	20.271	0.047	0.424	0.188	0.65	15.275	4.774	5.325	5.26	-0.001	0.226	0.074	
BHPSM01	2024/02/01 14:11	7.581	39.9	236	190.622	4.654	12.214	0.012	0.432	0.01	0.392	45.154	8.538	15.01	21.073	-0.001	-0.001	0.004	
BHPSM06	2024/02/18 18:11	6.35	12.6	120	64.632	0.825	5.88	0.141	0.359	0.027	0.538	5.58	5.368	7.622	10.449	-0.001	-0.001	0.406	
BHPSM08	2024/02/01 12:45	6.487	25.9	172	24.533	3.763	71.596	0.034	3.556	0.019	0.289	12.729	6.877	8.431	24.85	-0.001	-0.001	0.047	
BHPSM09	2024/02/18 18:02	7.29	16.8	148	88.497	0.299	1.781	0.065	0.363	0.023	0.462	11.574	3.575	7.369	16.873	-0.001	-0.001	-0.001	
BHPSM10	2024/02/01 14:30	8.18	44.2	324	242.284	9.56	4.681	0.06	0.189	0.022	0.559	48.78	7.103	22.577	29.634	0.008	-0.001	0.101	
BHPSM13	2024/02/01 12:14	7.958	32.04	174	166.637	4.309	6.213	0.022	0.443	0.021	0.673	28.175	4.12	11.966	31.903	-0.001	-0.001	-0.001	
BHPW05	2024/02/06 12:34	6.63	8.2	42	24.326	2.18	3.022	0.172	0.311	0.006	0.414	8.087	2.94	1.265	1.47	-0.001	-0.001	0.405	
BHPW07	2024/02/23 14:32																		
BHPW08	2024/02/07 14:52	7.18	17.7	172	88.183	0.322	4.766	1.188	0.65	0.042	0.338	17.909	0.993	6.141	7.028	0.015	-0.001	0.024	
WELBH01	2024/02/01 15:02	8	18.8	124	86.422	10.263	1.161	0.007	0.641	0.007	0.492	15.08	3.323	5.525	22.6	-0.001	-0.001	-0.001	
WELBH08	2024/02/21 13:21	8.04	39.4	244	220.357	1.921	3.318	8.118	0.274	0.021	0.258	38.146	3.103	21.25	16.532	-0.001	0.056	0.166	
WELBH16	2024/02/07 14:39	7.59	17.5	138	85.543	1.281	0.187	1.048	0.308	0.007	0.02	17.434	1.012	5.198	6.917	-0.001	-0.001	1.194	
WELBH24	2024/02/06 13:13	6.03	4.9	34	6.035	2.4	2.949	0.025	1.207	0.008	0.785	1.828	1.901	0.596	3.348	0.003	-0.001	0.067	
WELBH25	2024/02/23 12:09	7.01	10.5	118	44.292	4.3	0.568	0.041	0.296	0.007	0.079	8.019	3.28	3.764	5.891	-0.001	-0.001	0.305	
WELBH26	2024/02/21 13:35	8.63	33.1	194	182.535	3.554	7.397	0.067	0.446	0.013	0.998	13.74	2.677	4.394	65.728	0.022	-0.001	-0.001	
	Above the SANS limit			Above SANS Aesthetic Limits															Class II (max. allowable for limited duration)



## 5.10.2 Water quality results compared to WUL Limits

Groundwater analysis of samples collected at Klipspruit Colliery was compared to the WUL limits issued to the mine in the form of the water use licence authorisation. While the SANS limits and criteria is critical in assessing pollution within the mine and compliance with domestic water usage, WUL limits are critical in assessing contamination of groundwater resources within the mine. Table 5-45 shows the chemistry of groundwater samples compared with the WUL limits.

The comparison of groundwater samples with WUL limits suggest that only pH and Cl which are compliant in all groundwater samples. These two parameters are well below the maximum WUL limits in all samples. Non-compliant in terms of EC and Mg was noted in BSW 4. This borehole exceeded the WUL limit of 75.52 mS/m for EC and 32.71 mg/l for Mg. Ca is present at high concentration above the WUL limits of 32.56 mg/l in six boreholes. These boreholes include BSW 4, KGM 10, BH 008, BHPSM01, BHPW08, and BHPSM10.

The concentration of Na is high in three boreholes namely BSW 4, WELBH26, and WELBH27. Guideline exceedance was noted in these boreholes. Majority of the boreholes are contaminated with SO<sub>4</sub>, NO<sub>3</sub> and F. This is because the parameters were exceeded in more boreholes, especially NO<sub>3</sub> and F, with SO<sub>4</sub> only exceeded in ten boreholes. The concentration of NO<sub>3</sub> exceeded WUL limits in all boreholes. The concentration of F is compliant in five boreholes namely KGM 13, KGM B06, KGM B16, WELBH16, and WELBH25 with the remaining boreholes being classified as non-compliant. The concentration of SO<sub>4</sub> was noted in high concentration above the WUL limits in the following boreholes: BSW 4, KGM 10, KGM B04, KGM B06, KGM B11, KGM B16, BH 009, BHPSM01, BHPSM08, and WELBH27.

**Table 5-45: Water quality compared to WUL Limits.**

Site Name	Date Time	pH	EC mS/m	Ca mg/l	Mg mg/l	Na mg/l	Cl mg/l	SO4 mg/l	NO3-N mg/l	F mg/l
BSW 4	2024/02/27 10:52	7.08	133.7	151.554	90.236	46.088	8.94	646.897	1.422	0.446
KGM 08	2024/02/01 13:02	7.2	3.7	1.078	0.806	5.321	3.084	0.146	0.206	0.736
KGM 10	2024/02/01 13:13	8.176	38.2	49.02	20.944	12.29	11.654	28.936	0.804	1.625
KGM 13	2024/02/01 12:59	6.378	11.85	4.78	5.12	6.63	6.179	1.659	8.375	0.124
KGM B04	2024/02/01 15:16	7.94	26.2	25.897	9.81	19.314	16.624	31.468	0.479	0.262
KGM B06	2024/02/22 10:21	6.18	49.6	27.561	26.969	32.78	34.388	118.664	0.339	0.13
KGM B11	2024/02/18 19:02	6.3	14.2	10.413	4.782	9.878	0.802	12.516	0.422	0.298
KGM B16	2024/02/18 18:29	7.38	50.5	31.411	31.778	29.151	2.878	187.59	0.383	0.099
BH 008	2024/02/23 12:47	7.78	26.8	37.453	11.752	9.563	1.654	9.348	0.498	0.652
BH 009	2024/02/23 12:43	6.66	15.6	15.275	5.325	5.26	5.224	20.271	0.424	0.65
BHPSM01	2024/02/01 14:11	7.581	39.9	45.154	15.01	21.073	4.654	12.214	0.432	0.392
BHPSM06	2024/02/18 18:11	6.35	12.6	5.58	7.622	10.449	0.825	5.88	0.359	0.538
BHPSM08	2024/02/01 12:45	6.487	25.9	12.729	8.431	24.85	3.763	71.596	3.556	0.289
BHPSM09	2024/02/18 18:02	7.29	16.8	11.574	7.369	16.873	0.299	1.781	0.363	0.462
BHPSM10	2024/02/01 14:30	8.18	44.2	48.78	22.577	29.634	9.56	4.681	0.189	0.559
BHPSM13	2024/02/01 12:14	7.958	32.04	28.175	11.966	31.903	4.309	6.213	0.443	0.673
BHPW05	2024/02/06 12:34	6.63	8.2	8.087	1.265	1.47	2.18	3.022	0.311	0.414
BHPW08	2024/02/07 14:52	7.18	17.7	17.909	6.141	7.028	0.322	4.766	0.65	0.338
WELBH01	2024/02/01 15:02	8	18.8	15.08	5.525	22.6	10.263	1.161	0.641	0.492
WELBH08	2024/02/21 13:21	8.04	39.4	38.146	21.25	16.532	1.921	3.318	0.274	0.258
WELBH16	2024/02/07 14:39	7.59	17.5	17.434	5.198	6.917	1.281	0.187	0.308	0.02

The piper geochemical diagram was used to display the geochemical processes of groundwater at Klipspruit Colliery (Figure 5-41). The diagram has classified groundwater into the following classes:

- 🌿 Ca-HCO<sub>3</sub> water types
- 🌿 Na-HCO<sub>3</sub> water types
- 🌿 Mg-HCO<sub>3</sub> water types
- 🌿 Mg-SO<sub>4</sub> water types
- 🌿 Na-HCO<sub>3</sub> water types
- 🌿 Na-SO<sub>4</sub> water types

Table 5-46 shows detail summary of boreholes falling under each category.

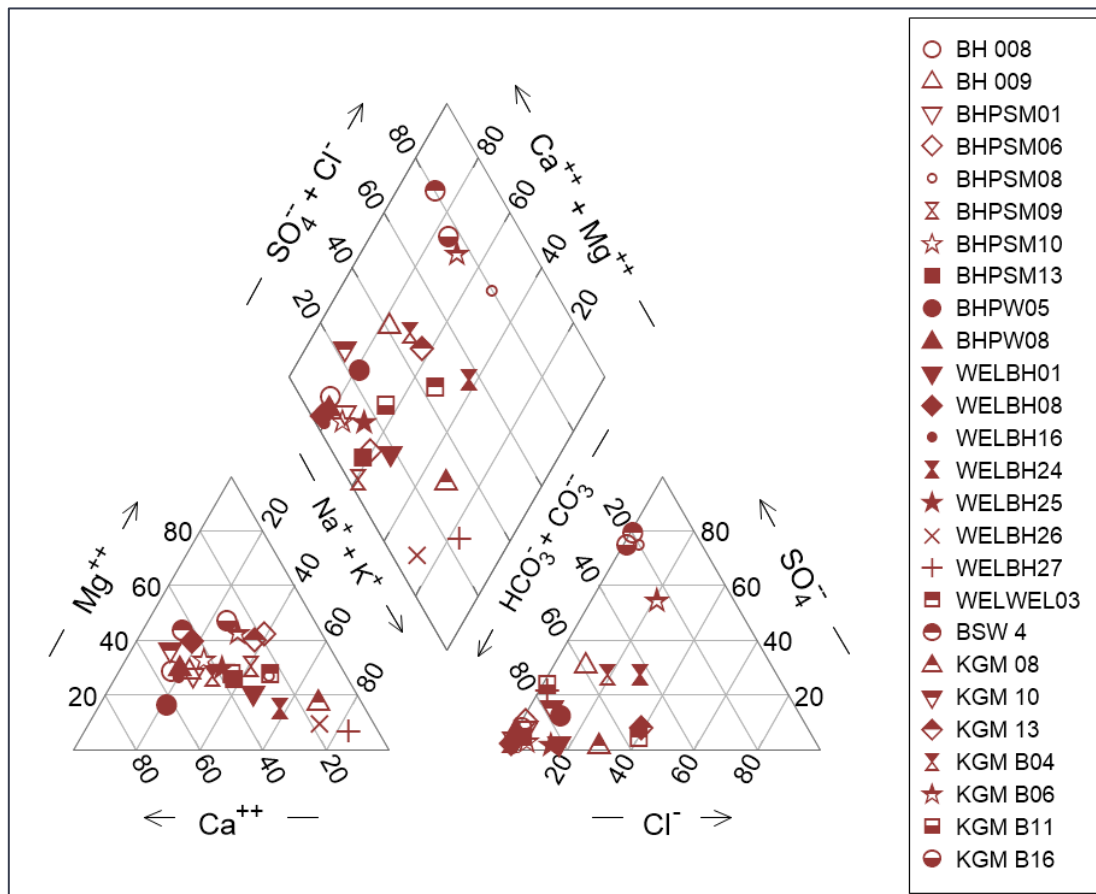


Figure 5-41: Geochemical classification using piper diagram.

**Table 5-46: Water type**

Sample ID	Water type
BH 008	Ca-HCO3
BH 009	Ca-HCO3
BHPSM01	Ca-HCO3
BHPSM10	Ca-HCO3
BHPW05	Ca-HCO3
BHPW08	Ca-HCO3
WELBH08	Ca-HCO3
WELBH16	Ca-HCO3
WELBH25	Ca-HCO3
KGM 10	Ca-HCO3
KGM B04	Ca-HCO3
KGM B11	Ca-HCO3
BHPSM06	Mg-HCO3
KGM 13	Mg-HCO3
BSW 4	Mg-SO4
KGM B06	Mg-SO4
KGM B16	Mg-SO4
BHPSM09	Na-HCO3
BHPSM13	Na-HCO3
WELBH01	Na-HCO3
WELBH24	Na-HCO3
WELBH26	Na-HCO3
WELBH27	Na-HCO3
WELWEL03	Na-HCO3
KGM 08	Na-HCO3
BHPSM08	Na-SO4

### 5.10.3 Surface Water Quality

Water quality monitoring at the KPS has been undertaken since 2004. Water quality data was benchmarked against the Loskop Dam water quality objectives and the Interim Resource Water Quality Objectives (IRWQO) for the Wilge River catchment.

#### 5.10.3.1 Historical Water Quality Database

Surface water monitoring was conducted over several study periods. In the period from March to May of 2004, Jones and Wagner conducted monitoring for an area downstream of the KPSS where eight samples were collected. The parameters pH, EC, SO<sub>4</sub>, TDS, NO<sub>3</sub>, Cl, Total Alkalinity, Ca, Mg, Na, Fe, F, Mn, Al, K and Si were assessed. The water quality results indicated that the pH was low (between 4 and 5) and that elevated Mn levels representing a health risk to sensitive groups were present at a location south of the project area. The water draining northwards was determined to be suitable for drinking purposes except slightly elevated iron (even after filtering) that may affect sensitive groups at the maximum levels (Jones and Wagner, 2007). Note that the baseline sampling was not updated for the 2007 surface water assessment report, since it was not expected that the baseline water quality would have

changed since the sampling undertaken in 2004. Additional monitoring at the KPSS has been undertaken by Seriti Power with the water quality analysis carried out by Yanka Laboratories. The monitoring database covers the period from 2010 to 2012. From this database there are 4 points within close proximity to the project area, namely K4, K5, K6 and K8 with data representing the baseline water quality in the project area and the rest of the sites indicating baseline levels for downstream of project area. The baseline update conducted by Digby Wells in 2014 has, as far as possible, tried to maintain the same monitoring points for update of the baseline data as detailed in Table 5-47. KPSX Surface Water monitoring sites (2012 and 2014 water quality database) below.

**Table 5-47: KPSX Surface Water monitoring sites (2012 and 2014 water quality database)**

Monitoring Location ID(2014)	Monitoring Location ID(2012)	Latitude	Longitude
KSSW04	K4 River Zaid Concor Colliery	28.987033	-26.064583
KSSW05	K5 Dam Enslin Farm Estate	29.005133	-26.068417
KSSW06	K6 Dam Kendal United 2& 4Seam	29.001350	-26.065700
KSSW08	K 8 Dam Ogies Coll. U/gMining	29.048750	-26.069533

At the KPSX project area, historical water quality monitoring data has been made available by South32. Collected water samples were analysed at Regen Waters Laboratory in Witbank and a surface water quality report was compiled by Jaco K. Consulting (2009). Eight (8) water samples were collected at various locations. Additional monitoring points were included on the 2014 and 2017 sampling rounds.

### 5.10.3.2 KPSX Water Quality Data Analysis

The KPSX water quality results are illustrated in Table 5-48 below and benchmarked against the IRWQO for the Wilge River catchment, in the Olifants water management area.

**Table 5-48: Water Quality Results**

River System	Sampling Sites	Baseline Water Quality Interpretation
		In 2009, SW1 had elevated levels of Cl, Alkalinity, SO <sub>4</sub> , Na, Al and Fe. Site SW1 is close to existing mine works, thus the water quality could have been influenced by contaminants from the mining operations to the left bank.
	Wel SW1,	SW2 is considered as good quality water.
	Wel SW2, Wel SW13	SW13 and SW1 upstream of Phola indicated good quality water for the 2014 sample run.
	CONSW1 CONSW2	In the recent 2017 sampling, CONSW1 which is on the same location as Wel SW1 is still showing improved qualities that are within the RWQO since 2014.

River System	Sampling Sites	Baseline Water Quality Interpretation
		CONSW2, which is the drainage feeding into the unnamed tributary of the Saalklapspruit (below CONSW1) showed elevated levels of Cl, Alkalinity, and Na.
Saalklapspruit	Wel SW7	Site SW7, a downstream point from the existing KPS mining area, shows good quality water during the 2014 sample run. However, in 2009 the water quality was very poor, with elevated TDS, Alk, SO <sub>4</sub> , Ca, Mg, Na, Mn and EC exceeding the IWQO. These are parameters that could be related to mining that took place upstream from this site.
	Wel SW11	Another tributary to the Saalklapspruit with good quality water during the 2014 sample run.
		Site SW8, most downstream point on the Saalklapspruit, shows parameters of concern similar for the 2014 and 2009 sampling runs. These parameters include Cl, Alk, Na, K, Mn, with additional parameters which were above the IWQO only in 2009 being SO <sub>4</sub> , EC and Al.
	Wel SW8	The parameters shown in 2014, are not indicated upstream of this point on this river at Wel SW11 and Wel SW7. This could potentially be impacts arising from the Phola STW discharge point, just upstream. This could imply that there is some input from Phola and activities on the tributary draining into Saalklapspruit; just before this point that were recorded in 2009. SO <sub>4</sub> and Al levels were elevated.
	Wel SW6	High Na, Mg, Al and F were recorded in 2009, exceeding the IWQO. There were no other activities in the area except the agricultural activities. These elements can be related to geology.
	Wel SW12	A tributary of the Saalklapspruit with good quality water.
	Wel SW14	A tributary of the Grootsspruit with good quality water.

River System	Sampling Sites	Baseline Water Quality Interpretation
Grootspruit	Wel SW3, Wel SW5, Wel SW4,	<p>Upstream point on the Grootspruit - SW3 was dry in 2014, but in 2009 the results indicated good quality water with only AI exceeding the IWQO.</p> <p>In the mid Grootspruit sampling site - SW5 located within sand mining area was of good quality in 2009 and 2014.</p> <p>However, SW4, the most downstream point indicates the highest level of contamination. This site is located downstream from other mines, west and southwest of Clewer town, Anker's Elandsfontein Colliery, Highveld Steel, as well as Anglo operations south of Clewer.</p> <p>There were elevated TDS, Cl, SO<sub>4</sub>, Ca, Mg, Na and EC in both sampling years. There were records of a low pH in 2009.</p>
Tweefonteinspruit	Wel SW9	<p>This site is on the Upper Tweefonteinspruit, upstream of Coalville town and south of a mined-out area. It presented a poor water quality with levels exceeding the IRWQO for TDS, Cl, SO<sub>4</sub>, Ca, Mg, Na, EC, Alk, K and Mn.</p> <p>The dirty water could be attributed to residual impacts of the mined out underground mining area immediately upstream, which could result as decant at downslope location.</p>

## 5.11 Socio-economic

The Project area is located in the Mpumalanga Province. Mpumalanga means "place where the sun rises". It is the second-smallest province in South Africa and located in the north-eastern part of the country, bordering Swaziland and Mozambique. The province covers a geographical area of 76 544.3 km<sup>2</sup> or 1.4% of the total surface area of South Africa. Mpumalanga is the second-smallest province in South Africa after Gauteng and is located in the north-eastern part of the country bordering Swaziland and Mozambique to the east.

The socio-economic study describes the current conditions of the community around the Klipspruit Colliery's proposed Unwabu Project. Key aspects include:

### Demographics:

- eMalahleni Local Municipality is diverse with the majority population being Black African, followed by smaller numbers of Coloured, Indian/Asian, and White residents

### Language and Household Composition:

- IsiZulu is the predominant language, followed by Afrikaans and Sepedi. Most residents live in formal housing, although informal dwellings are also present. Ownership levels are fairly balanced between fully owned properties and rentals.

**Education and Employment:**

- The highest educational attainment level is 'Some Secondary'. About 69% of the economically active population is employed primarily in the formal sector, while 18% are unemployed.

**Water and Sanitation:**

- Water is mainly supplied through regional or local schemes. Sanitation facilities vary, with a significant number of households having flush toilets connected to a sewer system, while others rely on pit latrines.

**Healthcare:**

- Access to quality healthcare is limited, particularly in rural areas. The region faces a quadruple burden of diseases including HIV/AIDS, tuberculosis, high maternal and child mortality, and non-communicable diseases.

**Infrastructure:**


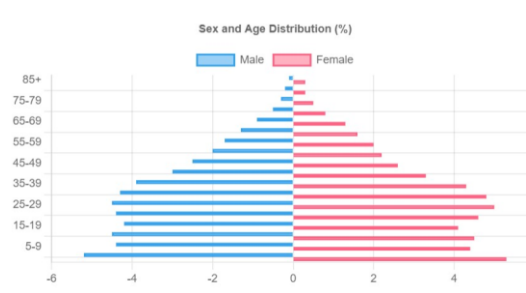
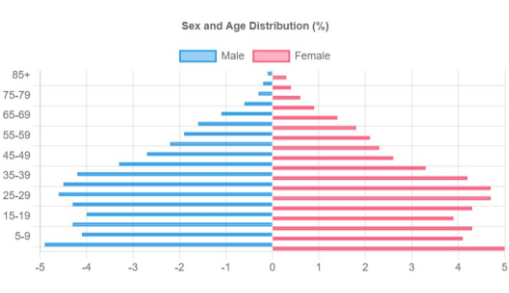
- Infrastructure issues such as inadequate roads, water supply, and electricity pose challenges to economic growth and development.


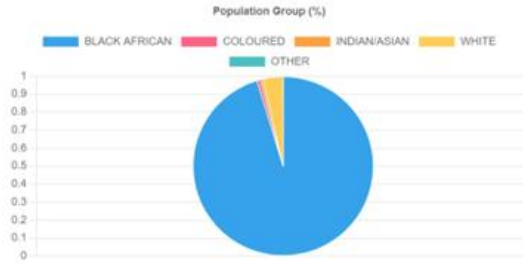
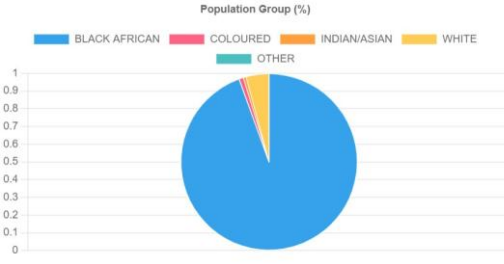

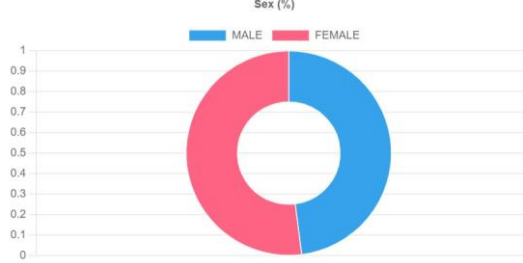

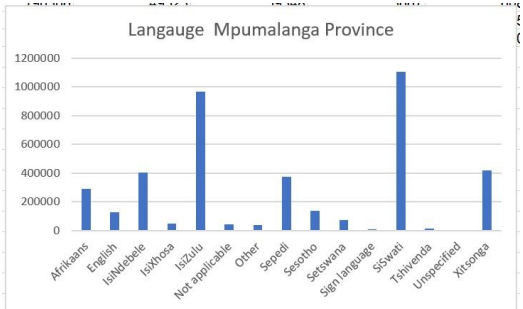
**Environmental and Social Issues:**


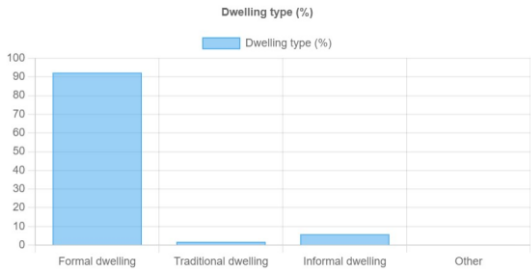
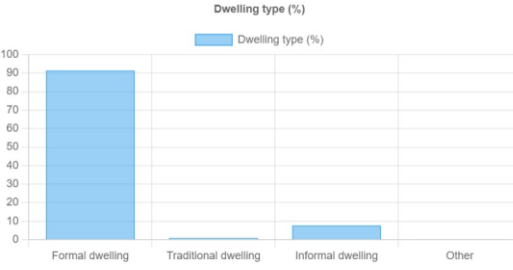

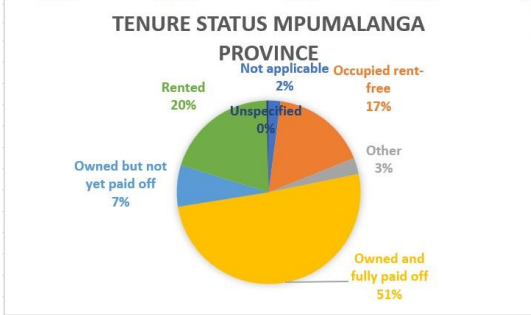
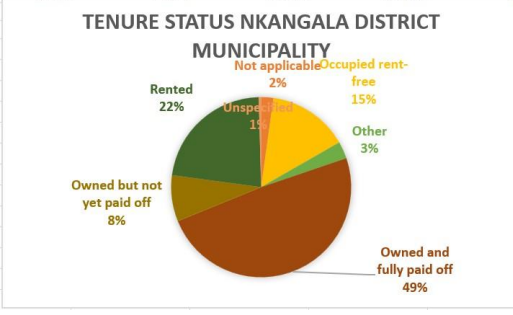
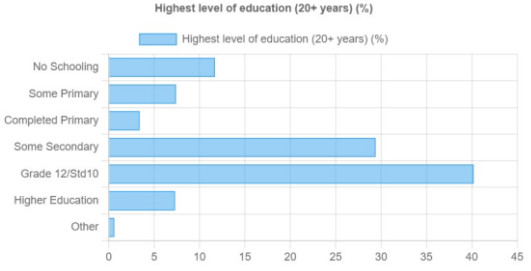
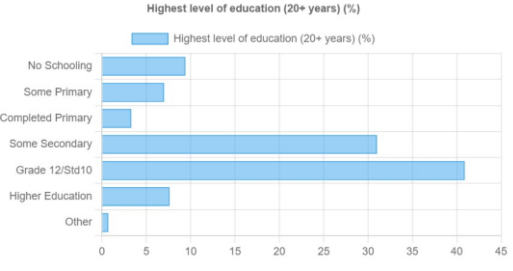
- The economy's reliance on natural resources contributes to environmental degradation. High HIV/AIDS prevalence and social inequalities in education, healthcare, and access to services are significant challenges.


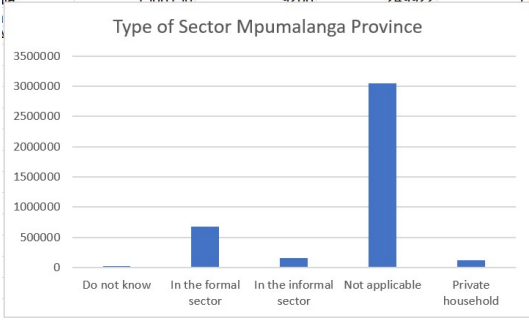
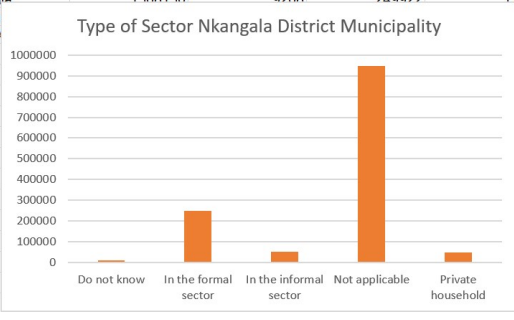

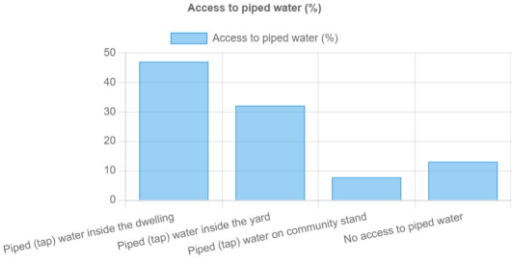
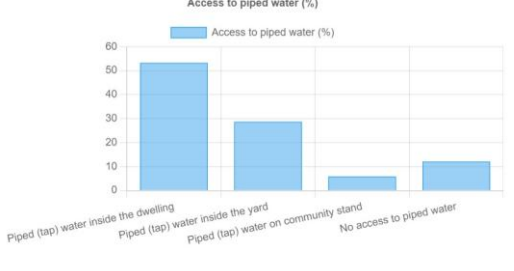

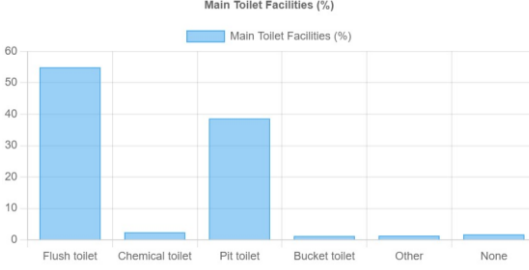
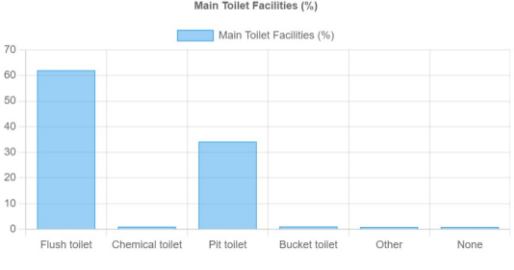
Below are summary tables of key statistics for the province, district municipality (DM), and key statistics for the local municipality (ELM).


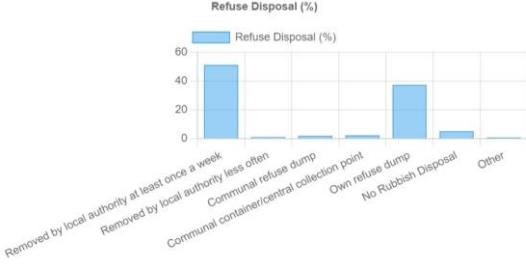
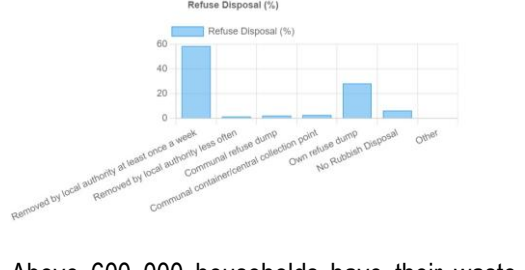
**Table 5-49: Summary of Key Statistics for the Province and DM**

Demographic Aspect	Mpumalanga Province	Nkangala District Municipality
<p>Age</p> 	 <p>The populous age group in the province is between ages 00 to 04. Followed Ages between 15 to 19.</p>	 <p>The populous age group in the district is between ages 00 to 04. Followed Ages between 25 to 29.</p>

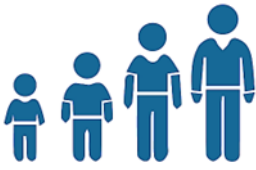
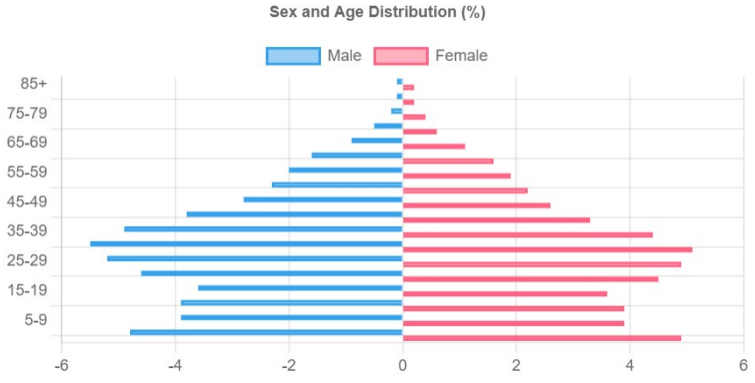
Demographic Aspect	Mpumalanga Province	Nkangala District Municipality
<p>Population</p> 	 <p>The majority of the population consists of Black African followed by Whites.</p>	 <p>The majority of the population consists of Black African followed by Whites.</p>
<p>Gender</p> 	 <p>There are slightly more females (51%) than males (49%).</p>	 <p>There are equal number of female and male (50%).</p>
<p>Language</p> 	 <p>The majority of the population in the province speak Siswati (above 1 000 000), followed by isiZulu (Below 1 000 000), then Xitsonga (above 400 000).</p>	 <p>The majority of the population in the district speak isiNdebele (above 350 00), followed by isiZulu (300 000), then Sepedi (below 200 000).</p>


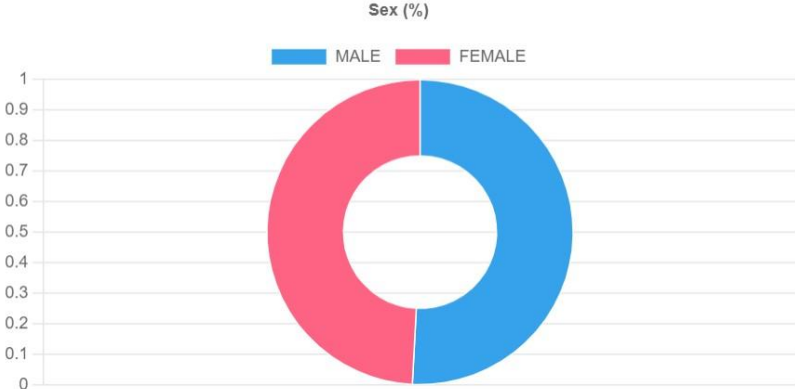

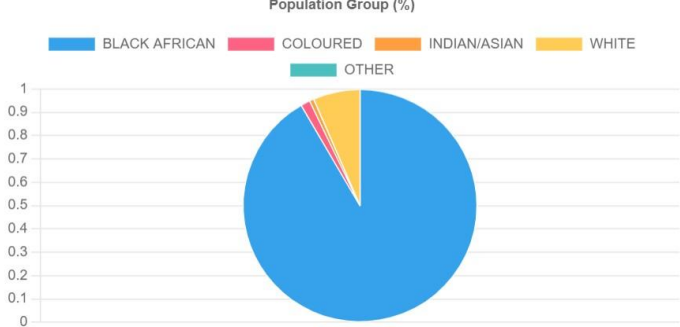

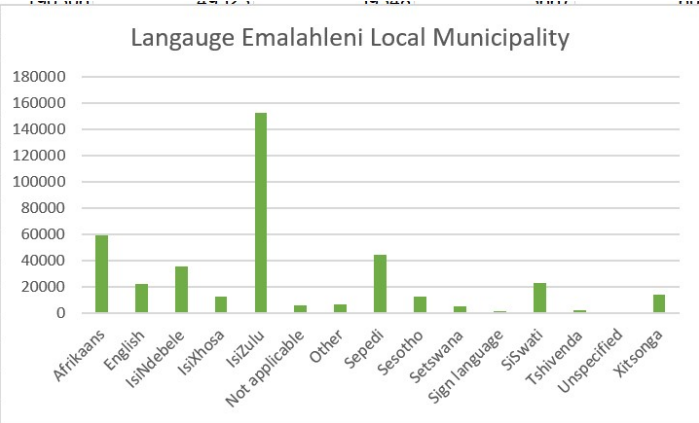
Demographic Aspect	Mpumalanga Province	Nkangala District Municipality
<p>Households</p> 	 <p>Majority of the population in the province live in house or flat household.</p>	 <p>Majority of the population in the district live in house or flat household.</p>
<p>Household Ownership</p> 	 <p>51% of the total population of the province have owned and fully paid off tenure status. While 20% have a rented status.</p>	 <p>49% of the total population of the district have owned and fully paid off tenure status. While 22% have a rented status.</p>
<p>Education Level</p> 	 <p>The population in the province have the highest education level at Grade 12. Followed by N6/NTC 6.</p>	 <p>The population in the district have the highest education level at Grade 12. Followed by N6/NTC 6.</p>


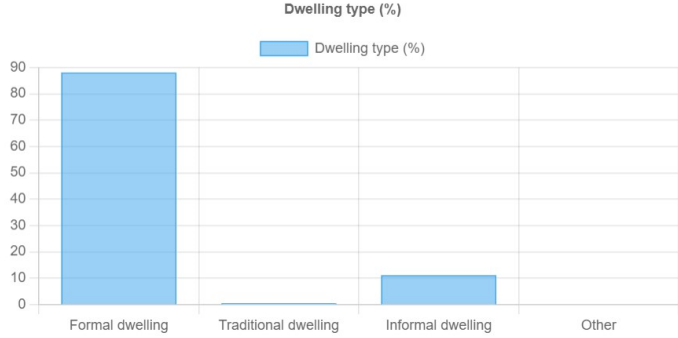
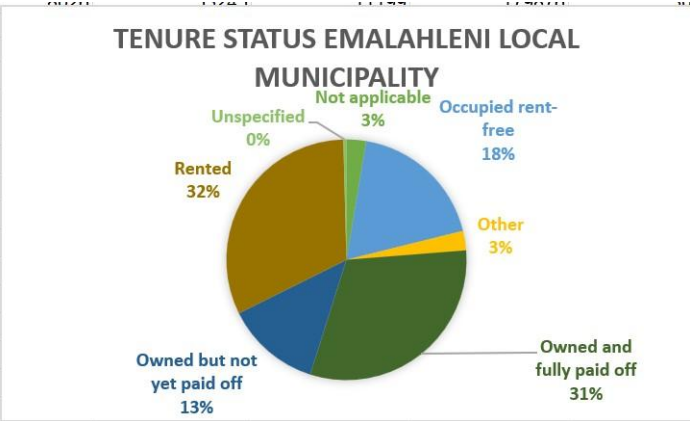

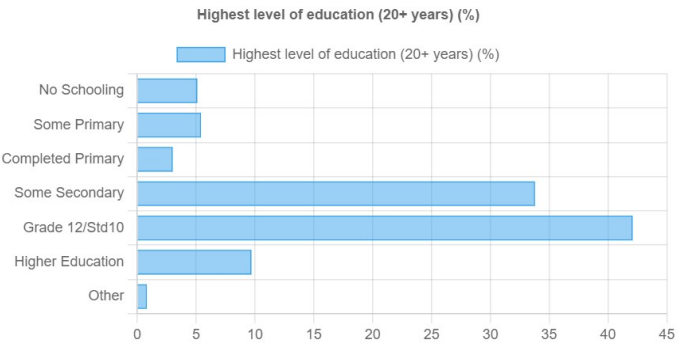
Demographic Aspect	Mpumalanga Province	Nkangala District Municipality
<p><b>Employment</b></p> 	<p><b>Type of Sector Mpumalanga Province</b></p>  <p>Most of the workforce in the province are employed in the formal sector (above 500 000).</p>	<p><b>Type of Sector Nkangala District Municipality</b></p>  <p>Most of the workforce in the district are employed in the formal sector (above 200 000).</p>
<p><b>Water</b></p> 	<p><b>Access to piped water (%)</b></p>  <p>Regional/local water scheme are the main source of water supply in the province followed by boreholes.</p>	<p><b>Access to piped water (%)</b></p>  <p>Regional/local water scheme are the main source of water supply in the district followed by boreholes.</p>
<p><b>Toilet Facilities</b></p> 	<p><b>Main Toilet Facilities (%)</b></p>  <p>Out of all the residents of the province, the majority of them have flush toilets that are connected to the sewerage system (below 500 000). Less than 400 000 have pit latrines without ventilation.</p>	<p><b>Main Toilet Facilities (%)</b></p>  <p>Out of all the residents of the district, the majority of them have flush toilets that are connected to the sewerage system (below 200 000). Above 100 000 have pit latrines without ventilation.</p>


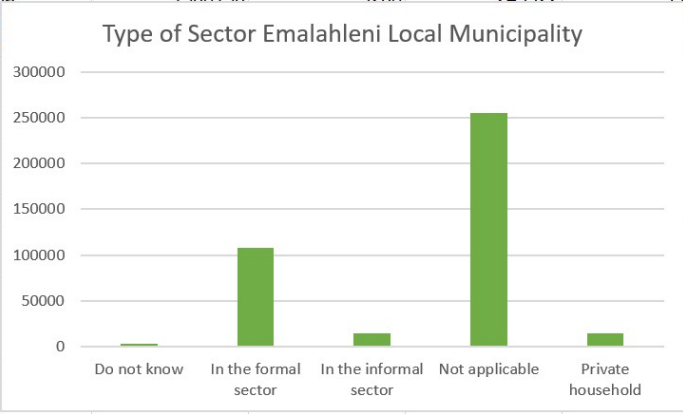

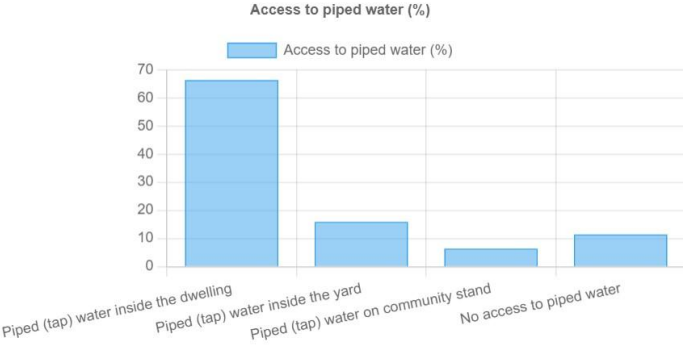

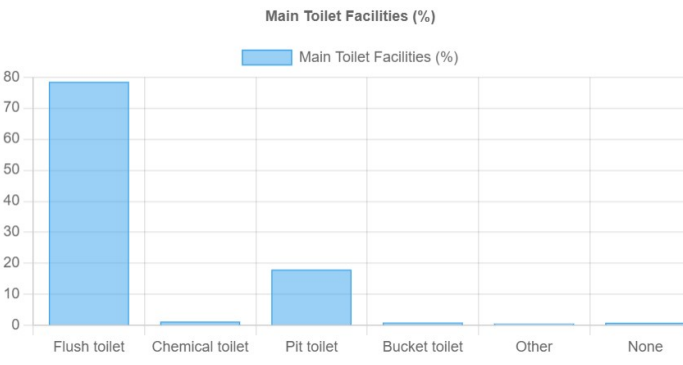
Demographic Aspect	Mpumalanga Province	Nkangala District Municipality
<b>Refuse Disposal/ Removal</b> 	 <p>Less than 2 million households remove their own dump followed by refuse which is collected by the local authority at least once a week.</p>	 <p>Above 600 000 households have their waste collected by the local authority at least once a week followed by people which dispose of their own dump.</p>


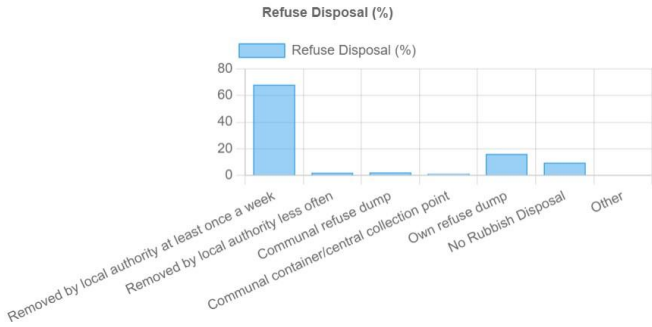
**Table 5-50: Summary of Key Statistics for the ELM**

Demographic Aspect	eMalahleni Local Municipality
<b>Age</b> 	 <p>The populous age group in eMalahleni is between ages 25 to 29. Followed Ages between 00 to 04.</p>

Demographic Aspect	eMalahleni Local Municipality
<p>Gender</p> 	<p style="text-align: center;">Sex (%)</p>  <p>There is 47% females and 53% males at eMalahleni.</p>
<p>Population</p> 	<p style="text-align: center;">Population Group (%)</p>  <p>eMalahleni is composed of all racial groups with 391,982 Black African, which shows an increase since 2011; Coloured 5 450; Indian or Asian 3 762 and White 54 033.</p>
<p>Language</p> 	<p style="text-align: center;">Language Emalahleni Local Municipality</p>  <p>The majority of the population in eMalahleni speak isiZulu (below 160 000), followed by Afrikaans at (60 000), then Sepedi at (above 40 000).</p>

Demographic Aspect	eMalahleni Local Municipality
<p>Households</p> 	<p style="text-align: center;">Dwelling type (%)</p>  <p>Majority of the population in eMalahleni live in house or flat household followed by informal dwellings.</p>
<p>Household Ownership</p>	<p style="text-align: center;"><b>TENURE STATUS EMALAHLENI LOCAL MUNICIPALITY</b></p>  <p>31% of the total population of eMalahleni have owned and fully paid off tenure status. While 32% have a rented status.</p>
<p>Education Level</p> 	<p style="text-align: center;">Highest level of education (20+ years) (%)</p>  <p>The population in ward eMalahleni of the Municipality have the highest education level at Some Secondary.</p>

Demographic Aspect	eMalahleni Local Municipality														
<p>Employment</p> 	<p><b>Type of Sector Emalahleni Local Municipality</b></p>  <table border="1"> <caption>Type of Sector Emalahleni Local Municipality</caption> <thead> <tr> <th>Sector</th> <th>Number of People</th> </tr> </thead> <tbody> <tr> <td>Do not know</td> <td>~5,000</td> </tr> <tr> <td>In the formal sector</td> <td>~110,000</td> </tr> <tr> <td>In the informal sector</td> <td>~15,000</td> </tr> <tr> <td>Not applicable</td> <td>~255,000</td> </tr> <tr> <td>Private household</td> <td>~15,000</td> </tr> </tbody> </table> <p>Just over two thirds (69%) of the ELM's economically active population are employed primarily in the formal sector. Approximately 18% are unemployed and a further 5% regard themselves as discouraged work seekers.</p>	Sector	Number of People	Do not know	~5,000	In the formal sector	~110,000	In the informal sector	~15,000	Not applicable	~255,000	Private household	~15,000		
Sector	Number of People														
Do not know	~5,000														
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Private household	~15,000														
<p>Water</p> 	<p><b>Access to piped water (%)</b></p>  <table border="1"> <caption>Access to piped water (%)</caption> <thead> <tr> <th>Access Type</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Piped (tap) water inside the dwelling</td> <td>~68%</td> </tr> <tr> <td>Piped (tap) water inside the yard</td> <td>~15%</td> </tr> <tr> <td>Piped (tap) water on community stand</td> <td>~8%</td> </tr> <tr> <td>No access to piped water</td> <td>~10%</td> </tr> </tbody> </table> <p>Regional/local water scheme are the main source of water supply in eMalahleni.</p>	Access Type	Percentage	Piped (tap) water inside the dwelling	~68%	Piped (tap) water inside the yard	~15%	Piped (tap) water on community stand	~8%	No access to piped water	~10%				
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Facility Type	Percentage														
Flush toilet	~78%														
Chemical toilet	~2%														
Pit toilet	~18%														
Bucket toilet	~1%														
Other	~1%														
None	~1%														

Demographic Aspect	eMalahleni Local Municipality
<p>Refuse Disposal/ Removal</p> 	 <p>Less than 300 000 of the refuse that is generated by the community of eMalahleni households is collected by the local authority at least once a week.</p>

### 5.11.1 Impact Assessment

The impact assessment identifies and evaluates potential socio-economic impacts of the Klipspruit Colliery's proposed Unwabu Project. Key impacts include:

 **Employment Opportunities:**

- The project is expected to create job opportunities during both construction and operational phases. However, these may also lead to social conflicts and increased in-migration.

 **Economic Impacts:**


- The project could positively influence the local economy through multiplier effects but might also result in the loss of agricultural land and dependency on the mine for local economic sustainability.

 **Community Development:**

- Local Economic Development (LED) projects could enhance community development and social upliftment.

 **Social Pathologies:**

- An influx of workers and job seekers could increase social pathologies, impacting community health and safety.

 **Health and Safety:**

- The project could pose health and safety risks to the community. It is crucial to implement mitigation measures to minimize these impacts.

 **Cumulative Impacts:**

- The cumulative impacts of the project on the local community and environment must be considered and managed effectively.

### **Mitigation Measures**

To address the identified impacts, several mitigation and enhancement measures are recommended:

- 🌱 **Employment and Training:**
  - Prioritize local hiring and provide training to enhance the skills of the local workforce.
- 🌱 **Community Engagement:**
  - Implement robust stakeholder engagement plans to ensure continuous dialogue with the community.
- 🌱 **Health and Safety Programs:**
  - Develop comprehensive health and safety programs to mitigate risks associated with the project
- 🌱 **Environmental Management:**
  - Adopt sustainable practices to minimize environmental degradation and promote long-term socio-economic benefits.

By addressing these socio-economic factors, the Klipspruit Colliery's proposed Unwabu Project aims to balance development with community well-being and environmental sustainability.

## **5.12 Exclusion of Blasting Impact Study**

The proposed expansion of Pit BD and the alteration of Pit H from opencast mining to underground mining, a Blasting Management Study was not deemed necessary as the mine does not intend on blasting.

This opinion addresses the exclusion of a blasting impact assessment study for a proposed expansion of Pit BD and Pit H underground Project that intends to utilize continuous miners. Continuous miners are specialized machines designed to cut and gather coal without the need for explosives. Given this mining method, it is pertinent to evaluate whether omitting a blasting impact assessment study is justified.

### **5.12.1 Continuous Miners**

Continuous miners are advanced machines designed to remove coal efficiently and safely from underground mines. This sub-section delves into the mechanics of how continuous miners work, their benefits over traditional blasting methods.



Figure 5-42: A typical CM

## 5.12.2 How Continuous Miners Work

### 5.12.2.1 Components of a Continuous Miner

- 🌿 Cutting Head: Equipped with a rotating drum fitted with tungsten carbide teeth that shear coal from the seam.
- 🌿 Gathering Arms: Mechanisms that collect broken coal from the floor and feed it into the machine's conveyor system.

- ✔ Conveyor System: A series of belts that transport coal from the cutting area to the rear of the machine.
- ✔ Crawler Tracks: Tracks that enable the machine to move and position itself in the mine.
- ✔ Hydraulic System: Provides power to the cutting head and other moving components.
- ✔ Operator's Cabin: Enclosed area from which the operator controls the machine, often with remote control capabilities.

#### 5.12.2.2 Operational Process

- ✔ Positioning: The machine is positioned at the coal face, where the seam is exposed.
- ✔ Cutting: The cutting head is activated, rotating and cutting into the coal seam. The head can be adjusted vertically and horizontally to reach the full extent of the seam.
- ✔ Gathering: Cut coal falls to the mine floor, where gathering arms scoop it onto the conveyor system.
- ✔ Conveying: The conveyor system transports coal to the rear of the machine, from where it is loaded onto shuttle cars, conveyor belts, or continuous haulage systems.
- ✔ Advancing: Once a section is mined, the machine advances to the next section, repeating the process.

#### 5.12.2.3 Safety and Efficiency Features

- ✔ Remote Control Operation: Allows the operator to control the machine from a safe distance, reducing exposure to hazards.
- ✔ Dust Suppression: Water sprays reduce dust levels, improving air quality and minimizing respiratory risks.
- ✔ Roof Bolting: Some models are equipped with roof bolters to install roof support as the machine progresses.
- ✔ Monitoring Systems: Sensors and monitoring systems track performance, coal quality, and machine health.

### 5.12.3 Benefits of Continuous Miners Over Blasting Methods

Continuous miners are highly efficient at extracting mineral resources, often leaving behind fewer un-mined deposits. Their precise cutting and loading mechanisms maximize resource recovery, reducing waste and environmental impact. This not only benefits mining companies but also helps conserve valuable resources.

#### 5.12.3.1 Enhanced Safety

One of the most significant positive effects of continuous miners is the improvement in safety for mine workers. These machines are designed to operate in confined spaces with minimal exposure to hazardous conditions. As a result, miners are less exposed to harmful dust, gases, and potential roof collapses. The controlled environment of a continuous miner cabin significantly reduces the risk of accidents, making mining operations safer for workers. In summary, CMs:

- ✔ Reduced Explosive Use: Eliminates the hazards associated with handling and using explosives.
- ✔ Remote Operation: Allows operators to control the machine from a distance, reducing exposure to dangerous conditions.

- Improved Air Quality: Dust suppression systems enhance air quality, reducing the risk of respiratory issues.

#### **5.12.3.2 Increased Productivity**

Continuous miners have significantly increased the rate at which coal and other minerals can be extracted from underground deposits. Unlike traditional methods, which rely on manual labour and slower equipment, continuous miners can operate 24/7, allowing for a continuous extraction process. This increased productivity has a positive impact on mining companies' bottom lines, as they can extract more material in less time.

#### **5.12.3.3 Performance**

A continuous miner offers trustworthy support at many coal production sites. Seriti has chosen this system for use in areas where they cannot safely perform longwall mining. However, the actual performance of a continuous miner machine depends upon several factors, including:

- The dimensions of the pillars in the mine
- The mine's ventilation scheme
- The company's haulage system

#### **5.12.3.4 Improved Resource Recovery**

Continuous miners are highly efficient at extracting mineral resources, often leaving behind fewer un-mined deposits. Their precise cutting and loading mechanisms maximize resource recovery, reducing waste and environmental impact. This not only benefits mining companies but also helps conserve valuable resources.

#### **5.12.3.5 Reduced Environmental Impact**

Continuous miners are designed to be more environmentally friendly than traditional mining methods. Their efficient extraction processes and reduced waste generation contribute to a smaller ecological footprint. Additionally, continuous miners are equipped with advanced dust control systems, minimizing air pollution and improving air quality in the surrounding areas.

- Reduced Vibration and Noise: Continuous miners generate less vibration and noise compared to blasting, minimizing disturbance to surrounding areas.
- Less Overbreak: More precise cutting reduces the amount of non-coal material extracted, minimizing waste.

#### **5.12.3.6 Better Working Conditions**

Continuous miners offer improved working conditions for miners. The enclosed cabin of the machine provides protection from harsh environmental conditions and noise, enhancing the comfort and well-being of operators. As a result, worker satisfaction and retention rates have improved in mines that utilize continuous miners.

#### **5.12.3.7 Automation and Technological Advancements:**

Continuous miners are equipped with advanced automation and monitoring systems, allowing operators to control and monitor the machine remotely. This reduces the need for workers to be in potentially dangerous areas of the mine. Furthermore, continuous miners can be equipped with sensors and data collection tools to gather valuable information about the mining process, leading to more informed decision-making and improved operational efficiency.

#### **5.12.3.8 Versatility**

Continuous miners are versatile machines that can be adapted for various mining applications, including coal, salt, potash, and more. Their flexibility makes them suitable for a wide range of geological conditions, allowing mining companies to use them in different locations and mining projects.

#### **5.12.3.9 Efficiency**

While the initial investment in continuous miners may be substantial, their long-term benefits in terms of increased productivity and reduced operating costs are undeniable. They require less maintenance and have longer lifespans compared to older mining equipment, making them a cost-effective choice for mining companies in the long run.

- 🌱 **Increased Productivity:** Continuous miners can remove large volumes of coal quickly and continuously, unlike the intermittent process of blasting.
- 🌱 **Reduced Downtime:** Continuous operation minimizes downtime associated with setting up and detonating explosives.

#### **5.12.3.10 Operational Flexibility**

- 🌱 **Adaptability to Seam Conditions:** Continuous miners can operate in a variety of coal seam conditions, including thin seams and irregular formations.
- 🌱 **Consistent Coal Quality:** Continuous mining produces a more uniform coal product, improving overall quality control.

Continuous miners are a critical component of the coal mining industry. Although drilling costs increase, as Continuous Mining utilizes twice to three times as many holes as conventional blasting therefore an increase in explosive costs per hole, and explosive costs are significantly higher than conventional blasting, these machines enhance productivity and safety, contributing to the efficient extraction of coal in diverse geological conditions. Continuous miners represent a significant advancement in underground coal mining technology. Their ability to improve efficiency, safety, and environmental impact makes them a preferred choice over traditional blasting methods. In South Africa, the adoption of continuous miners has revolutionized coal mining, driving productivity and enhancing safety standards in the industry.

### **5.12.4 Technical Rationale**

Continuous miners are employed in underground coal mining to extract coal from seams without the use of explosives. These machines operate using a rotating cutting head equipped with tungsten carbide teeth to shear coal from the seam. The coal is then gathered by mechanical arms and transported via conveyor systems. The primary advantages of continuous miners include:

- ✔ Elimination of Explosives: Continuous miners do not require explosives, thereby negating the associated risks and impacts of blasting.
- ✔ Reduction of Vibration and Noise: The cutting action of continuous miners produces significantly less vibration and noise compared to blasting.
- ✔ Dust Control: Continuous miners are often equipped with dust suppression systems, minimizing airborne particulates.

### 5.12.5 Environmental Impacts

The use of continuous miners significantly alters the environmental impact profile of the mining operation. Key considerations include:

- ✔ Air Quality: Blasting generates substantial dust and releases gases such as NO<sub>x</sub> and CO<sub>2</sub>. Continuous miners, with integrated dust suppression systems, drastically reduce airborne particulate matter.
- ✔ Ground Vibration: Blasting induces ground vibrations that can affect structural integrity and stability of nearby infrastructure. Continuous miners produce minimal vibration, mitigating this risk.
- ✔ Noise Pollution: The detonation of explosives produces high levels of noise, impacting both workers and nearby communities. Continuous miners operate at lower noise levels.
- ✔ Seismic Activity: Blasting can induce minor seismic events. Continuous mining avoids this risk altogether.

## 5.13 Conceptual Rehabilitation Plan

The conceptual rehabilitation plan is designed for the proposed underground mining expansion and therefore will consider surface infrastructure that will be developed in support of the proposed expansion areas. An adit with the supporting UG conveyors will be constructed to support the UG mining at KPSS. This will be constructed on the existing KPSS OC highwall. Further, additional ventilation shafts and rescue boreholes will be constructed in strategic areas as the mining advances for both KPSX and KPSS. To manage additional dewatering activities from the UG workings, pipelines will be constructed which will link up with existing pipelines on surface and discharge in existing PCDs. Should there be a need in future, a storage dam might also be constructed underground. Potable water supply to the UG workings will be delivered by pipelines which will link up with the existing potable water supply from the Emalahleni Water Treatment Plant. All other existing infrastructure will be utilised to support the proposed UG mining development including PCDs, power supply, haul roads, workshops, pipelines and water supply.

### 5.13.1 Pre-Mining

It is important to prepare the land area before mining takes place to ensure that planned activities are conducted efficiently and limit the damage to the receiving environment. Furthermore, the preparation during the pre-mining stage aids in the mine being able to achieve maximise utilisation and recovery of soils, vegetation and other ecologically important aspects of the project area. Some of the points that should be considered during the construction phase of the project are as follows:

- ☛ Mine planning should minimise the area to be occupied by mine infrastructure. The affected area should be kept as minimal as practically possible and should be clearly defined and demarcated;
- ☛ Care should be taken around sensitive landscapes e.g. wetlands to ensure that impacts to them are none to minimal and that the buffer zones around these sensitive landscapes are taken into account;
- ☛ Construction crews should restrict their activities to planned areas and training on good practices must be conducted to ensure compliance to the instructions and statutory requirements;
- ☛ Infrastructure should be designed with closure in mind. Infrastructure should either have a clearly defined dual purpose or should be easy to demolish. This aspect of rehabilitation should be considered if changes in the mine design are made;
- ☛ Soil stripping is a very important process which determines rehabilitation effectiveness. It should be done in strict compliance with the soil stripping guidelines, which should define the soil horizons to be removed; and
- ☛ If rock quarries or borrow pits are required include them into the environmental plans, however it is suggested that other material could be utilised to avoid further impacts to soils.

### 5.13.2 Post-Mining Land Use

Land capability determination is to grade the potential of the land in terms of its best and worst uses in an arable situation. The land is classified according to its limitations, either on a permanent or temporary basis. The system is biased towards soil conservation and is based on the negative features of the land. The classification system is categorised on a scale of I to VIII so yield potential matrices can be easily formulated. Land Capability Class (LCC) I soils to LCC III soils are suitable for arable crops. LCC IV soils can sometimes be cultivated for annual crops, but under carefully controlled conditions. LCC V soils are usually wetlands while LCC VII and VIII soils are suited to domestic livestock and wild game only. The Land Capability Classes and descriptions are presented in **Table 5-51**. The final post-mining use has been identified as Class VI (grazing), although the land could be classified as Class III or Class IV (arable), it is most practical to utilize the land for grazing.

**Table 5-51: The Land Capability Classes (Camp et al., 1998)**

Land Capability Class	Description	Land Capability Group
Class I	Little to no limitations, high potential for intensive arable use	Arable
Class II	Land subject to certain limitations or hazards. It is suitable for cropping with adequate protection measures, which may sometimes include special management practices and regular rotations	

Land Capability Class	Description	Land Capability Group
Class III	Land subject to moderate limitations or risk of damage, which is suitable for cropping only with intensive protection measures and special practices, which may include long ley rotations with short cropping periods	
Class IV	Land subject to severe permanent limitations or hazards. Suitable for occasional row cropping in long ley rotations, or for use under perennial vegetation. Limitations may include: steep slopes, shallow soils, soils of very low water-retaining capacity, high erodibility, unfavourable characteristics in the surface soil, and severe, but correctable, wetness	
Class V	Watercourses and land subject to wetness limitations. These limitations include temporary, periodic and semi-permanent wetness. Cultivation is only permitted with very special practices and measures. Vleis and watercourses subject to severe wetness are best left under permanent vegetation	Grazing
Class VI	Land which has such severe soil and/or slope limitations that cropping must be excluded but which is productive under perennial vegetation, but is susceptible to moderate erosion	
Class VII	Not suited for cultivation, severe limitations for grazing or farming	Wilderness
Class VIII	Extremely rough, suited only for wildlife or recreation	

### 5.13.3 Soil Management

Soils can be considered the most vital ecological component, particularly for effective rehabilitation. It is important that soils are handled with care and treated with the final result (post-mining capability) in mind. The proposed mining method will be underground mining; however, there will be development of necessary surface infrastructure which will require that soils be handled in the correct manner.

#### 5.13.3.1 Soil Stripping Method

Correct stripping of soils will firstly ensure that enough soils are available for rehabilitation and secondly, that the soils are of adequate quality to support vegetation growth and thus ensure successful rehabilitation. The following requirements should be considered wherever possible:

- ✔ Over areas of deep excavation strip all usable soil as defined (700 mm). Stockpile alluvial/colluvial (transported wet based) soils separately from the in-situ materials, which in turn should be stored separately from the underlying overburden. Store the soils in berms or stockpile dumps of no more than 1.5m high if space allows;
- ✔ At rehabilitation replace soil to appropriate soil depths in the correct order, and cover areas to achieve an appropriate topographic aspect and attitude so as to achieve a free draining landscape that is as close as possible the pre-mining land capability rating;
- ✔ Over area of conveyor servitudes strip the top 150 mm of usable soil over all affected areas and stockpile in longitudinal stockpile within the mining lease area;
- ✔ The lower portions of the subsoil's (>500 mm) and the soft overburden material (where removed) can be stored as separate stockpiles close to the areas where they will be required for backfilling and final rehabilitation;
- ✔ It is proposed that prior to soil stripping, an appropriate fertilizer should be added to the sandy loams and silty clay loams at a rate of about 200 kg/ha if they have not previously been fertilized. This will help to enhance the seed pool and encourage growth within the stored materials;
- ✔ Soils should be stripped and replaced using the truck and shovel method as far as possible. This method will limit the compaction of soils and soils must be stripped when dry to minimise compaction;
- ✔ Close supervision will ensure that soils are being stripped from the correct area and to the correct depths, and placed on the correct stockpiles to minimise compaction; and
- ✔ The handling of the stripped topsoil must be minimized.

#### 5.13.3.2 Stockpiling of Soils

Stockpiling should be minimised as far as possible since it increases compaction and decreases the viability of the seed bank.

The steps that should be taken during soil stockpiling are as follows:

- ✔ Mark stockpile locations accurately on a plan to ensure that re-handling is minimised (i.e. soils will not have to be moved a second or third time);
- ✔ Ensure that the location is free draining to minimise erosion loss and waterlogging;
- ✔ Minimise compaction during stockpile formation. The soils should be kept loose by, preferably, tipping at the edge of the stockpile not driving over the stockpile (avoid end-tipping as this causes compaction).
- ✔ The positions of the soil stockpiles should be indicated on a map and the soil stockpiles should be protected using a fence because soil loss due to unauthorised use can and will occur.
- ✔ Restrictive stockpile heights are usually recommended because soil quality is affected negatively by anaerobic conditions occurring in large stockpiles. The stockpile height in the case of the Platreef Project can be adjusted according

to the space needed because the soil will be stored for a long time before used for rehabilitation purposes. Limit the stockpile height so as to prevent internal compaction (soil stockpiles should be <2 m in height);

- ☛ Re-vegetate with a seed mixture similar to the final rehabilitation seed mixture; and
- ☛ Ensure that the stockpiled soil is only used for the intended purposes.

#### 5.13.4 Removal of Infrastructure

The final land use of the post-mining landscape is expected to be grazing and therefore the removal of surface infrastructure such as conveyer belts must take place. In some instances, surface infrastructure that can be utilized for other purposes can be left as is; however, this must be well documented and accounted for.

There are steps to consider during the removal of infrastructure with the main aspects being safety of contractors and consideration of the final landscape. These are a few factors (Tanner *et. al.*) to consider when designating and removing surface infrastructure:

- ☛ Identify infrastructure items that may be of use to the future land users;
- ☛ In association with those users and the authorities, define what could be left, how it would be used and how sustainable that use would be;
- ☛ The remaining infrastructure should be assessed for its suitability for re-use/recycling;
- ☛ The re-usable items should be removed from the site;
- ☛ Hazardous material locations and deposits require specialised assessment and analysis to determine how these materials should be decontaminated and to ensure that all residual hazardous materials are deposited in officially-sanctioned hazardous waste deposit sites;
- ☛ Mining infrastructure that will be left on site must be rendered safe;
- ☛ Remaining structures should be demolished and the demolition rubble removed;
- ☛ The final landform agreed for the infrastructure areas should be created; and
- ☛ Soil should be replaced on the disturbed area and revegetated.

##### 5.13.4.1 Ventilation Shafts

Ventilation shafts are part of the safety features that are necessary for underground mining to take place safely and in accordance with safety standards. These have surface infrastructure ([Figure 5-43](#)) as well as tunnels that are established in the underground mine, the key consideration is the sealing and making safe of these ventilation shafts and any other routes to the underground workings. In all cases, all the access routes must be sealed.

It is recommended that for the closure and rehabilitation of the ventilation shaft, the procedure involves the removal of surface infrastructure, filling of the shaft, as far as practically possible with inert rubble from demolition, or waste materials. The shaft must

be sealed with concrete seals, designed by a professional engineer and approved by the DMR and should be positioned in unweathered rock to ensure that they are permanent.

In addition, it will be a requirement to install “breather” pipes for gas release, or for water release systems where the ultimate re-establishment of the water table will result in water decant from the shaft position. Finally, the seals should be covered with inert material and topsoil and then re-vegetated.



**Figure 5-43: A typical ventilation shaft surface infrastructure (Greene Group Consulting Engineers (Pty) Ltd, 2024)**

#### **5.13.4.2 Conveyor Belt**

The conveyor belt will be used to transport mined resources to the processing plant and as presented in **Figure 5-44**, the conveyor belt is linear infrastructure that may cover a long distance, depending on the requirements. Although it is linear the conveyor belt will alter a long surface area and during the removal of the infrastructure, it must be ensured that these areas are rehabilitated which includes the removal of all infrastructure, removal of fixtures and any concrete foundations, the ripping and preparation of the soil and revegetation of the area.



**Figure 5-44: A typical conveyor bel carrying mined resources**

#### **5.13.4.3 Rescue Boreholes**

Rescue boreholes are a part of an underground operation's safety and rescue plan and are drilled strategically as the underground mining progresses. These boreholes are large diameter boreholes ( ) and will have surface infrastructure to facilitate access and rescue operations, as well as subsurface tunnels and casings along with whatever is deemed necessary, including refuge bays. During the closure and rehabilitation phase, the operation, on expert advice, decommission all these boreholes or maintain others as release boreholes after closure. Those that will be decommissioned will be required to remove all surface infrastructure, remove casings and any other infrastructure associated and then backfill these boreholes as far as practically possible with inert rouble from demolition, or waste materials. The shaft must be sealed with concrete seals, designed by a professional engineer and approved by the DMR and should be positioned in unweathered rock to ensure that they are permanent.



**Figure 5-45: Large diameter drilling for rescue boreholes (Georoc, 2024)**

### 5.13.5 Subsidence

It is proposed that waste rock material will be utilised to fill the bords and that the pillars will be removed. This is being undertaken to allow for complete extraction of the mineral from the underground workings. It is important to note that when pillar extraction “robbing” is undertaken that there is a potential risk for subsidence to occur. This is as a result of the back areas being left unsupported and are allowed to collapse. This collapse will continue until the resistance to compaction of the collapsed material equals the weight of the overlying material. The rate of collapse can be slow and it is anticipated that the rate of collapse will take several weeks for 90% of the total subsidence to occur, the remainder subsidence will occur over several years.

To mitigate against the potential of subsidence occurring at KPSS and KPSX will use a paste material to fill the bords left and then remove the pillars. This is being done to avoid the risk of subsidence occurring as the roof of the underground workings will be supported by the constructed pillars from waste material. In order to mitigate against the possibility of subsidence occurring a Rock Mechanic should be consulted during the process to ensure the correct safety factors are put into place

### 5.13.6 Final Landform and Shaping

Once the mine site has been cleared of all infrastructure and rubble the exposed underlying materials should be reshaped to create a gently sloping, free-draining topography. The topsoil that was removed during the construction phase should be replaced, fertilised and ripped.

In cases where the foundations of the structures are impractical to remove, the foundations should be covered with a combination of soft overburden or B horizon material topped with a layer of topsoil. This layer should be at least 1 m thick.

After these tasks have been completed the infrastructure sites can be included in the rehabilitation process for the rest of the mining area for re-vegetation, monitoring and maintenance.

The question is raised time and time again, can impacted mine land be rehabilitated back to the pre-mining land use and will there be a reduction in the land capability post mining (impacts to crop yields pre and post mining). The answer to this question is dependent on several factors, such as the capability of the mine to undertake rehabilitation successfully, soil stripping and stockpiling during mining, placement of soil during rehabilitation, progressive monitoring of both topsoil stockpiles and rehabilitated areas and nutrients available in the soil post rehabilitation.

### 5.13.7 Vegetation

The objectives for the re-vegetation of reshaped and top-soiled land are to:

- 🌿 Prevent erosion;
- 🌿 Re-establish eco-system processes to ensure that a sustainable land use can be established without requiring fertilizer additions; and
- 🌿 Restore the biodiversity of the area as far as possible

To ensure successful vegetation, the following steps are to be treated as a best-practice guide:

1. Ensure that the soils have been replaced correctly according to the soil replacement guideline;
2. All soils are to be ripped to full potential rooting depth to correct compaction induced by the soil replacement activity;
3. Analyse the topsoil to determine the lime and fertilizers requirements;
4. Prepare the soil by adding lime and fertilizer and ploughing the area, followed by tillage to prepare the seed bed;
5. Plant a grass seed mixture consisting of a range of indigenous or non-invasive naturalised species. For wetland areas, *Imperata cylindrica* (Cotton Wool Grass) can be hand planted and hydrophilic species can be worked into the seed mix. Recommendations regarding the seed mixtures for both grassland areas and wetland areas is provided further on in the report (Where good quality grazing land or wilderness land soil is replaced by direct transfer – this will be avoid the need to plant grass mixtures. The majority of plant species present in the un-mined areas will re-establish naturally, provided the soils are replaced correctly and the tillage is done correctly;

6. Inspect the area after a good rainfall event;
7. Control and remove weeds where necessary;
8. Repeat the procedure for the next growing season;
9. Application of fertilisers is crop and site specific, analysis of the soils and stockpiles should be undertaken to determine the appropriate fertilisers to be used, if required;
10. Define and establish the long-term land management system (grass needs regular defoliation if it is to be sustainable);
11. Leave pasture to allow natural grasses to become re-established;
12. Conduct annual monitoring (repeatable demarcated transect surveys); and
13. Steps 9 to 12 will apply for areas that were previously under crops, or where significant infestations of alien species were present. Initial establishment of improved pastures will result in a more ecologically satisfactory end product.

#### **5.13.7.1 Secondary Grassland**

There will be areas of the surface that will not be impacted by surface infrastructure; however, are considered poor secondary grassland. These areas must be continually rehabilitated and monitored to ensure that species diversity is introduced. Furthermore, these areas will serve as template for final closure phase and as a seed bank at the final stage. It is therefore recommended that a species plan and fertilization strategy be developed and/or implemented for these areas that will remain unaffected by infrastructure footprint.

#### **5.13.7.2 Infrastructure Areas**

The areas that will need to be backfilled, cleared and re-soiled must be revegetated to protect the soil and promote diversity throughout the project area in the post-mining landscape. It is imperative that revegetation of these areas considers preservation of soil and establishment of vegetation above diversity in the initial closure period.

#### **5.13.7.3 Methods of Vegetation**

The common methods used to establish vegetation include seeding and hydroseeding. Flat areas should be seeded using tractor implements and slopes too steep for tractors should be hydroseeded.

In the event where soils are stripped and returned directly (i.e. no stockpiling) and the areas stripped have good vegetation cover with suitable species present, natural re-colonisation may occur and there will be no need for re-seeding. In this case, it may be best to simply replace the stripped soils, lightly level and rip thoroughly, and leave for one growing season to assess the extent and suitability of the natural re-vegetation, however, this method is not suitable for any areas previously infested with alien invader species such as wattle.

Mulching with locally cut grass will also enhance the seed bank and ecological succession.

#### 5.13.7.4 Alien Invasive Plants (AIP) and Weed Management

Alien invasive species are known to proliferate in areas that have been disturbed and will outcompete the indigenous flora leading to large infestations. It is important that an AIP Management Plan be developed and updated accordingly for the duration of the mining and the post-mining phase.

##### 5.13.7.4.1 Control Measures

Alien species control programmes are long-term management projects and should consist of a clearing plan which includes follow up actions for rehabilitation of the cleared area. The lighter infested areas should be cleared first to prevent the build-up of seed banks. Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently. Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of alien species are easily dispersed across boundaries by wind or watercourses. All clearing actions should be monitored and documented to keep records of which areas are due for follow-up clearing.

##### 5.13.7.4.2 Mechanical Control

This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ringbarking or bark stripping. This control option is only really feasible in sparse infestations or on a small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive and could cause severe soil disturbance and erosion.

Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. Care should however be taken that the clearing methods used do not encourage further invasion and that they are appropriate to the specific species of concern. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum. Fire should not be used for alien species control or vegetation management at the site. The best-practice clearing method for each species identified should be used.

**Table 5-52: Advantages and Disadvantages of Mechanical removal**

Advantage	Disadvantage
Effective method in areas with low infestations	Not an effective method for dense infestations, as the cost of clearing is extremely high, with little or no impact
High job creation and associated poverty alleviation potential	Time consuming – may be slower to complete than other forms of control
No contamination of water with herbicides as these are applied directly to the tree	If no herbicides are used, then the manual control techniques must be very well executed to ensure success

##### 5.13.7.4.3 Chemical Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien plant invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- ☛ Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- ☛ All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- ☛ Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of at a suitable site.
- ☛ To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- ☛ Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- ☛ The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.
- ☛ The use of chemicals is not recommended for wetland areas.

For all herbicide applications, the following Regulations and guidelines should be followed:

- ☛ Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.
- ☛ Pesticide Management Policy for South Africa published in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) – GNR 1120 of 2010.
- ☛ South African Bureau of Standards, Standard SANS 10206 (2010)

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to “*acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container*”.

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Agriculture, Forestry and Fisheries.

**Table 5-53: Advantages and Disadvantages of Chemical removal**

Advantage	Disadvantage
Achieve results over a short period (within 6 weeks of application).	Herbicides are expensive.
Large areas can be treated quickly.	The use of herbicides may contaminate sites used for drinking water, for washing and for fishing, and can therefore threaten human and animal health
Complements mechanical control methods, increasing the effectiveness of IAP control activities.	May kill non-target plants or species.
	Specialised training and certification is required for use of herbicides

### 5.13.8 Monitoring Plan

The plan will provide details as to the frequency of the monitoring efforts to ensure the maintenance of the system is conducted. The primary focus for the plan is to evaluate the success of the rehabilitation efforts. Numerous monitoring frequencies have been proposed for this aspect of the project, the details of which are presented in Table 5-54. Further descriptions (clarity) of the referred to frequencies is discussed below.

**Rehabilitation:** Monitoring will be required for the wetlands during the rehabilitation period to determine if the measures are being applied correctly, and if any unforeseen issues need to be addressed. This monitoring can be undertaken by the Environmental Control Officer (ECO) appointed to oversee compliance for the project.

**Post-rehabilitation:** After completion of the rehabilitation phase, wetland areas should be monitored to evaluate the success of the rehabilitation efforts. In the unlikely event of potential "risks" to the systems being identified, this inspection may allow for corrective measures to be applied. This monitoring can be undertaken by the Environmental Control Officer (ECO) appointed to oversee compliance for the project.

**Seasonal monitoring:** The applicant must appoint an independent contractor to conduct seasonal (wet season) monitoring for a period of two years after the completion of the rehabilitation measures. The monitoring should be conducted during October or shortly after the first summer rains, and also after any intensive rainfall events. A further monitoring surface should be conducted towards the end of the wet season (March). The monitoring should inspect the following:

- 🌿 Evidence of any erosion gullies or scouring of the area;
- 🌿 Recovery of the vegetation layer;
- 🌿 Extent of alien vegetation establishment;
- 🌿 Effect of storm water management, and structural integrity and efficiency;
- 🌿 The stability of the embankments and gabion structures; and
- 🌿 The ecological integrity and functioning of the wetland system

**Table 5-54: The proposed monitoring plan for the project**

Variables	Methods	Monitoring Frequency	Indicator	Corrective Action
Wetland status and functioning	<ul style="list-style-type: none"> <li>Standard wetland methods to determine wetland PES, EIS and ecological services</li> </ul>	<ul style="list-style-type: none"> <li>Bi-annually for the first two years post-closure</li> </ul>	<ul style="list-style-type: none"> <li>Maintain (at least) the REC for the wetland system</li> </ul>	<ul style="list-style-type: none"> <li>Regular inspections and monitoring of the wetlands.</li> <li>Review and amended rehabilitation measures to be implemented for corrective action</li> </ul>
Vegetation cover	<ul style="list-style-type: none"> <li>Monitor species and cover abundance</li> <li>Monitor indigenous vs alien plant encroachment</li> <li>Photography record</li> </ul>	<ul style="list-style-type: none"> <li>After rehabilitation</li> <li>Seasonal for the first two years</li> </ul>	<ul style="list-style-type: none"> <li>Establishment of primarily indigenous plants</li> <li>Ground cover abundance must be increasing</li> </ul>	<ul style="list-style-type: none"> <li>Replanting of indigenous plants should be done at sites of concern</li> </ul>
Erosion	<ul style="list-style-type: none"> <li>On-site inspection</li> <li>Photography record</li> <li>Compare to adjacent areas</li> </ul>	<ul style="list-style-type: none"> <li>After rehabilitation</li> <li>Seasonal for the first two years post-closure and soon after heavy rainfall events</li> </ul>	<ul style="list-style-type: none"> <li>Areas with no cover</li> <li>Erosion gullies and flow paths</li> <li>Storm water discharge area</li> </ul>	<ul style="list-style-type: none"> <li>Short term: Rocks / boulders, and on-site debris</li> <li>Medium term: Replanting of indigenous vegetation</li> <li>Long term: Rehab methods that may include gabion baskets, mattresses and should be discussed with specialists</li> </ul>
Sedimentation	<ul style="list-style-type: none"> <li>On-site inspection</li> <li>Photography record</li> </ul>	<ul style="list-style-type: none"> <li>During &amp; after rehabilitation</li> <li>Seasonal for the first two years post-closure and soon after heavy rainfall events</li> </ul>	<ul style="list-style-type: none"> <li>Scouring and erosion of the area</li> <li>Excess sediment in wetlands</li> </ul>	<ul style="list-style-type: none"> <li>Sources of sedimentation should be noted and addressed</li> <li>If possible, excess sediment can be removed manually.</li> </ul>
Exotic Invasive Plant Species	<ul style="list-style-type: none"> <li>Monitor exotic invasive plant encroachment</li> <li>On-site inspection</li> <li>Photography record</li> </ul>	<ul style="list-style-type: none"> <li>After rehabilitation and follow-up clearing</li> <li>Seasonal for the first two years post-closure</li> </ul>	<ul style="list-style-type: none"> <li>Establishment of exotic invasive plant species</li> </ul>	<ul style="list-style-type: none"> <li>Removal of exotic plants.</li> <li>Do not use chemicals for the removal process</li> </ul>

## 5.14 Knowledge Gaps

The following knowledge gaps have been identified, concerning threats, opportunities and uncertainties to the compilation of the plan:

- ✔ Complete a numerical or analytical groundwater model for the project site for a closure scenario;
- ✔ Ongoing surface water and groundwater quality monitoring during the operational LoM to determine trends over time and
- ✔ to monitor changes in water quality over time to determine if the mine is impacting water quality and/or quantity within the vicinity of the mine;
- ✔ Updated approved rehabilitation designs for all areas;
- ✔ Rehabilitation audits confirming the standard and sustainability of the rehabilitation undertaken; and
- ✔ Ongoing engagement with communities and stakeholders surrounding the area to develop a social closure plan.

Additional work will be required to improve the understanding of the abovementioned gaps and reduce the level of uncertainty. It is recommended that these knowledge gaps be addressed as soon as possible once the mine has been commissioned.

## 5.15 Financial Provision Determination

### 5.15.1 Costs Determination

Regulations 53 and 54 of the MPRDA require that the holder of a mining right must make full financial provision for rehabilitation of negative environmental impacts.

The methodology is guided by the Department of Mineral Resources (DMR) "Guideline Document for the Evaluation of the Quantum of Closure- related Financial Provision Provided by a Mine" (DME, 2005), as per the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

- ✔ The financial provision must guarantee the availability of sufficient funds to undertake the following:
- ✔ Rehabilitation of the surface area;
- ✔ The prevention and management of pollution of the atmosphere;
- ✔ The prevention and management of pollution of water and the soil;
- ✔ The prevention of leakage of water and minerals between subsurface formations and the surface; of the adverse environmental impacts of the listed or specified activities;
- ✔ Decommissioning and final closure of the operations;
- ✔ Post closure management of residual and latent environmental impacts.

As part of the transitional period, the Department of Mineral Resources (DMR) still accepts the DMR quantum methodology<sup>1</sup> as part of the transitional period of GN R1147 (Government Gazette 42464, 2019).

### **5.15.2 Describe The Closure Objectives and The Extent to Which They Have Been Aligned to The Environmental Authorisation Described Under the Regulation.**

The existing rehabilitation and closure objectives for KPS include the following:

- ✔ Identify post-closure uses of land occupied by mine infrastructure in consultation with the surrounding landowners. Should a suitable use for any mine infrastructure not be found, it will be demolished and removed;
- ✔ Rehabilitate all disturbed land to a condition that is suitable for its post-closure uses;
- ✔ Rehabilitate all disturbed land to a condition that facilitates compliance with applicable environmental quality objectives, such as air and water quality objectives as an example;
- ✔ Reduce the visual impact of the mine components through rehabilitation of all disturbed land and residue deposits;
- ✔ Rehabilitate all disturbed land and residue deposits to a condition where post-closure management is minimised; Develop a retrenchment programme promptly;
- ✔ Keep authorities informed of the progress of the activities during the Decommissioning Phase;
- ✔ Submit monitoring results to the relevant authorities; and
- ✔ Maintain the required pollution control facilities and the condition of the rehabilitated land following closure.

<sup>1</sup> DMR (2004): Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision by a Min

**Table 5-55: Closure Cost FY2024**

No.	Description	Unit	Quantity - 2023	Quantity - 2024	Variance %	Master Rate - 2023	Master Rate - 2024	Variance %	Amount (Rand) - 2023	Amount (Rand) - 2024	Increase/decrease	Variance %
1	Dismantling of processing plant	m <sup>2</sup>	21 108	21 218	0.5%	R1869	R1964	5.1%	R394 450	R416 727	R22 277	5.6%
2(A)	Demolition of steel buildings & structures	m <sup>2</sup>	42 012	42 654	1.5%	R256.38	R269.45	5.1%	R10 770 874	R11 493 177	R722 303	6.7%
2(B)	Demolition of reinforced concrete structures	m <sup>2</sup>	226 908	226 988	0.0%	R377.82	R397.09	5.1%	R85 730 261	R90 134 271	R4 404 010	5.1%
3	Rehabilitation of access roads	m <sup>2</sup>	2 051 880	2 014 715	-1.8%	R45.88	R48.22	5.1%	R94 136 176	R97 145 107	R3 008 930	3.2%
4(A)	Demolition and rehabilitation of electrified railway lines	m	38 394	38 394	0.0%	R445.29	R468.00	5.1%	R17 096 251	R17 968 160	R871 909	5.1%
5	Demolition of housing and facilities	m <sup>2</sup>	24 071	24 071	0.0%	R512.75	R538.90	5.1%	R12 342 716	R12 972 194	R629 479	5.1%
6	Open cast rehabilitation including final voids and ramps	ha	485	439	-9.4%	R260 964.97	R274 274.19	5.1%	R126 523 648	R120 469 451	R6 054 197	-4.8%
8(A)	Rehabilitation of overburden and spoils	ha	281	260	-7.5%	R179 194.15	R188 333.05	5.1%	R50 335 637	R48 957 384	R-1 378 253	-2.7%
8(C)	Processing waste deposits and evaporation ponds (acid, metal)	ha	450	443	-1.7%	R648 229.44	R681 289.14	5.1%	R291 955 857	R301 744 508	R9 788 651	3.4%
9	Rehabilitation of subsided areas	sum	64	67	4.7%	R150 048.11	R157 700.57	5.1%	R10 103 079	R10 565 938	R462 859	4.6%
10	General surface rehab and grassing	ha	823	939	14.2%	R141 951.99	R149 191.54	5.1%	R116 795 615	R140 131 768	R23 336 153	20.0%
12	Fencing	m	44 623	44 623	0.0%	R161.92	R170.18	5.1%	R7 225 512	R7 594 013	R368 501	5.1%
13	Water management	ha	360	421	17.0%	R53 974.14	R56 726.82	5.1%	R19 406 942	R23 855 558	R4 448 615	22.9%
14	2 to 3 years of maintenance and aftercare	ha	2 333	2 528	8.4%	R18 890.95	R19 854.39	5.1%	R44 070 758	R50 198 108	R6 127 350	13.9%
<b>Sub-total 1: Sum of items (1 - 15)</b>									<b>R886 887 778</b>	<b>R933 646 366</b>	<b>R46 758 588</b>	<b>5.3%</b>
Preliminary and general costs: Add 6% of sub-total 1 if sub-total 1 > 100 000 000									R53 213 267	R56 018 782		
Weighing factor 2: Multiply P&G cost by Weighing factor 2 (1.05)									R55 873 930	R58 819 721		
Contingency: 10% of sub-total 1									R88 688 778	R93 364 637		
<b>Sub-total 2: Sum of weighing factor 2 &amp; contingency</b>									<b>R144 562 708</b>	<b>R152 184 358</b>		
<b>Sub-total 3: Sum of sub-totals 1 &amp; 2</b>									<b>R1 031 450 485</b>	<b>R1 085 830 723</b>	<b>R54 380 238</b>	<b>5.3%</b>
VAT: 15% of sub-total 3									R154 717 573	R162 874 608		
<b>GRAND TOTAL</b>									<b>R1 186 168 058</b>	<b>R1 248 705 332</b>		

### 5.15.3 Motivation for Amendments

The rehabilitation and closure plan has been aligned with the proposed mining method and associated infrastructure changes for KPS and no further amendments are required.

## 6 Analyses and Characterisation of Activity

### 6.1 Site Delineation for Characterisation

KPS occupies a total footprint of 1647 ha. All mining and related activities that take place at KPS occur within the mine boundary area. The proposed underground mining for Pit BD and Pit H will also be located within the mine boundary.

### 6.2 Water and Waste Management

The general principle of water management is the recognition that water is a scarce resource. This in turn leads to the other principles such as water use minimisation (water conservation), the re-use of water, pollution prevention or the limitation of pollution of water. All water that can be kept clean will be kept clean and dirty water areas will be minimised. No water is discharged unless authorised by the DWS especially water that exceeds the catchments water quality objectives, as set by the DWS, with the exception of emergency conditions if safety should demand so. All the relevant principles contained in DWS's Best Practice Guidelines (BPG) will be utilised for all designs and management practises.

Seriti Power understands that their operations have an impact on the environment and is committed to undertaking the requisite impact assessments to develop the necessary systems and practices to mitigate their impact during the entire lifecycle of their operations and associated infrastructure such as the slurry transporting pipelines, and to assess their performance on an on-going basis. Seriti Power recognises that they operate in an environment of scarce resources and will endeavour to optimise their usage.

KPS aims to conduct environmental management in such a manner as to ensure the Best Practicable Environmental Option (BPEO) is implemented and compliance to the prevailing legislation, including the WULs, is achieved as far as practicable.

#### 6.2.1 Stormwater Management

Clean stormwater from upstream of the mine areas, plant and work areas have been diverted around the mine, plant and water management dam by canals or berms, and were sized to prevent spilling for flood events up to 1:50 year flood event. The stormwater management system is designed to keep the stormwater clean and return it to the Saalklapspruit. Stormwater run-off from the rehabilitated spoils will also gravitate to the Saalklapspruit. The updated SWMP confirms that clean/dirty water separation at Pits BD and H is based on catchment delineation and flow direction assessment, and that diversion berms and channels are used to divert clean runoff away from dirty-water areas and to convey dirty runoff to containment facilities (PCDs) in accordance with GN R704 (1:50-year design requirement). For Pit H, the SWMP confirms that the pit footprint is treated as the primary dirty catchment area and that a stormwater berm around the pit is proposed to prevent clean runoff entering the pit, with dirty water and groundwater ingress accumulating in the pit sump and being pumped to PCD 1 for reuse. The SWMP further identifies that where diversion

channels discharge to the environment, erosion protection measures (e.g., energy dissipation structures) must be implemented at outlet points, and that stormwater infrastructure (channels, outfalls and culverts) must be maintained and inspected regularly to prevent siltation, blockages and overflow.

### 6.3 Water and Salt Balance Update

The 2023/2024 Water and Salt Balance (WSB) update for Klipspruit Colliery, conducted by WSP for Seriti Power (Pty) Ltd is undertaken as part of the annual compliance requirements of the Water Use Licence (WUL) for Klipspruit Colliery. The WSB update addresses both operational and post-closure water management strategies, assessing water inflows, outflows, and storage needs across the mining site. This report integrates WSB outcomes to ensure that water use aligns with environmental regulations and operational efficiency. The report is included in Appendix M of this report.

The primary objective of the Water and Salt Balance (WSB) is to model and understand all water uses across Klipspruit Colliery and to identify excess water generation, groundwater ingress, and potential pollution risks. The model also guides decisions on dewatering strategies, post-closure water management, and water reuse within operational activities.

#### 6.3.1 Findings and Results

The 2023/2024 Water and Salt Balance (WSB) update identified significant water ingress from precipitation, pit dewatering, and site runoff. The Balancing Dam is the primary collection point for excess water, with a current capacity of 400 000 m<sup>3</sup>. Groundwater inflows into the Weltevreden underground area are projected to peak in 2032 and will require continuous monitoring. Post-closure, decant from the Main Pit is expected to continue towards the Saalklapspruit River, with the model predicting decant volumes reaching 2 750 m<sup>3</sup>/day by 2143. The table below shows the decant elevations, water levels, and volumes for various pits, which is crucial to understanding the mine's water management needs.

**Table 6-1: Levels and volumes associated with the different mining areas**

Mining Area	Decant Elevation (mamsl)	Lowest floor elevation (mamsl)	Current water level (mamsl)	Current water volume in spoils (m3)	Total water capacity in spoils (m3)
Main Pit	1511.2	1497	1515.97 –Ramp 1 1514.8 –Ramp 1 Void	187 756 377	1 877 563 77 <sup>1</sup>
Bankfontein	1548	1530	1543	1 240 000	199 906 24 <sup>1</sup>
KPSS East	1583.5	1520.5	-	0	113 107 76 <sup>1</sup>
KPSS West		1519	-	0	56 006 306 <sup>2,3</sup>
Pit BD	1530.3	1472.8	-	0	64 213 96 <sup>1</sup>
Weltevreden UG		1453	-	0	688 797 94 <sup>2</sup>

<b>Mining Area</b>	<b>Decant Elevation (mamsl)</b>	<b>Lowest floor elevation (mamsl)</b>	<b>Current water level (mamsl)</b>	<b>Current water volume in spoils (m3)</b>	<b>Total water capacity in spoils (m3)</b>
<b>Pit H</b>	1531.2	1490.7	-	0	41 654 41 <sup>1</sup>
<b>Pit S</b>	1568.5	1530	-	0	9 341 76 <sup>1</sup>
<b>Beryl Mining</b>	1530.5	1521.5	-	0	439 61 <sup>1</sup>

As part of the 2023/2024 Water and Salt Balance (WSB) update, the inflows and outflows of water at Klipspruit Colliery were thoroughly assessed.

The Figure 6-1 and Figure 6-2 visually represent the inflows and outflows for the main area of the colliery, highlighting how water is distributed across operational areas, collected as excess water, and managed through reuse or discharge. These figures provide an essential understanding of the water balance dynamics at the mine, showing the relationship between water inputs (e.g., rainfall, groundwater ingress) and outputs (e.g., evaporation, pumping, and water treatment).

By analysing these figures, it becomes clear how water moves through different systems on-site, where the potential risks of water excess exist, and how those risks are mitigated through operational management and infrastructure design.

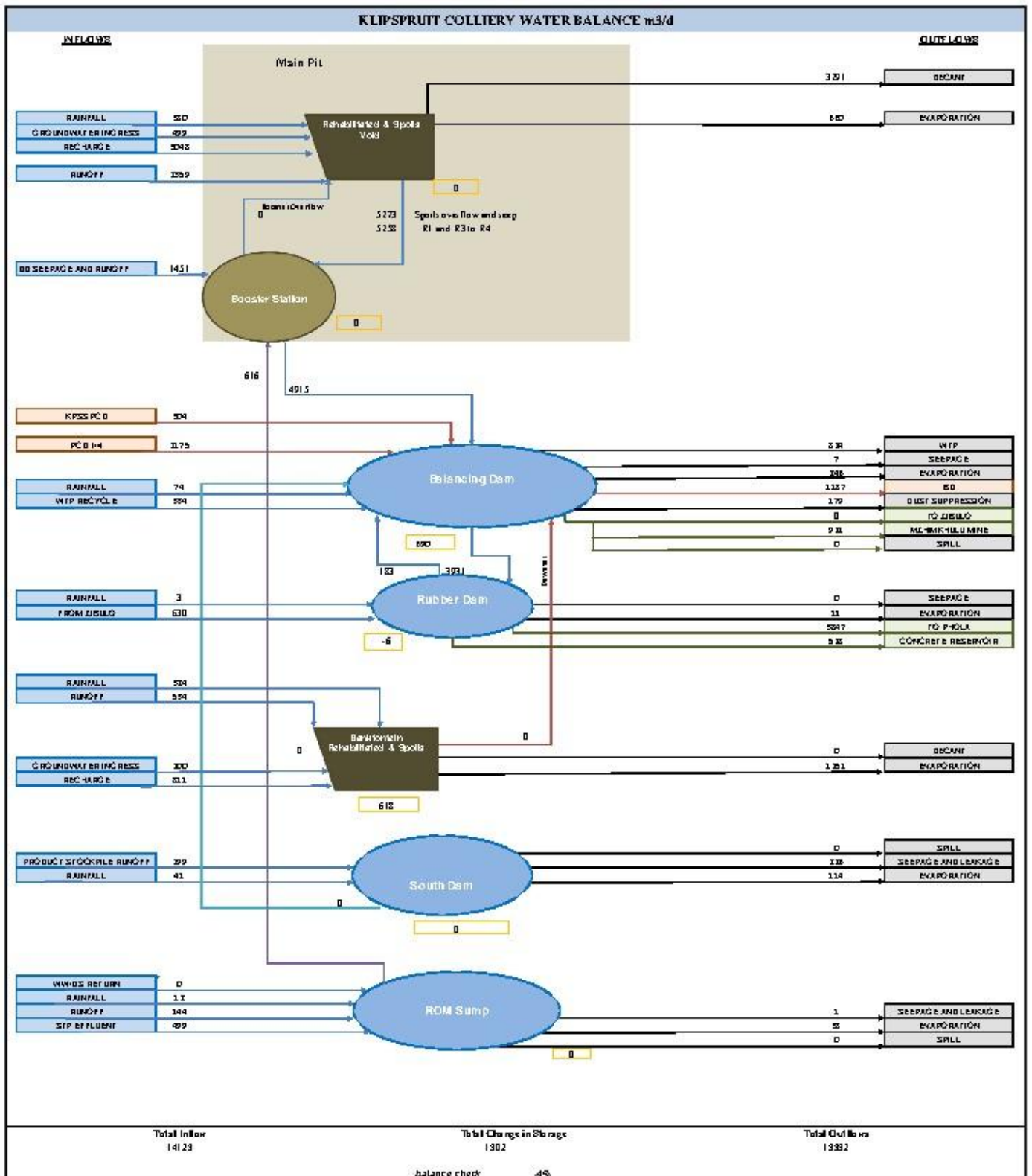


Figure 6-1: Annual average water balance results page 1 (KPS Main area)

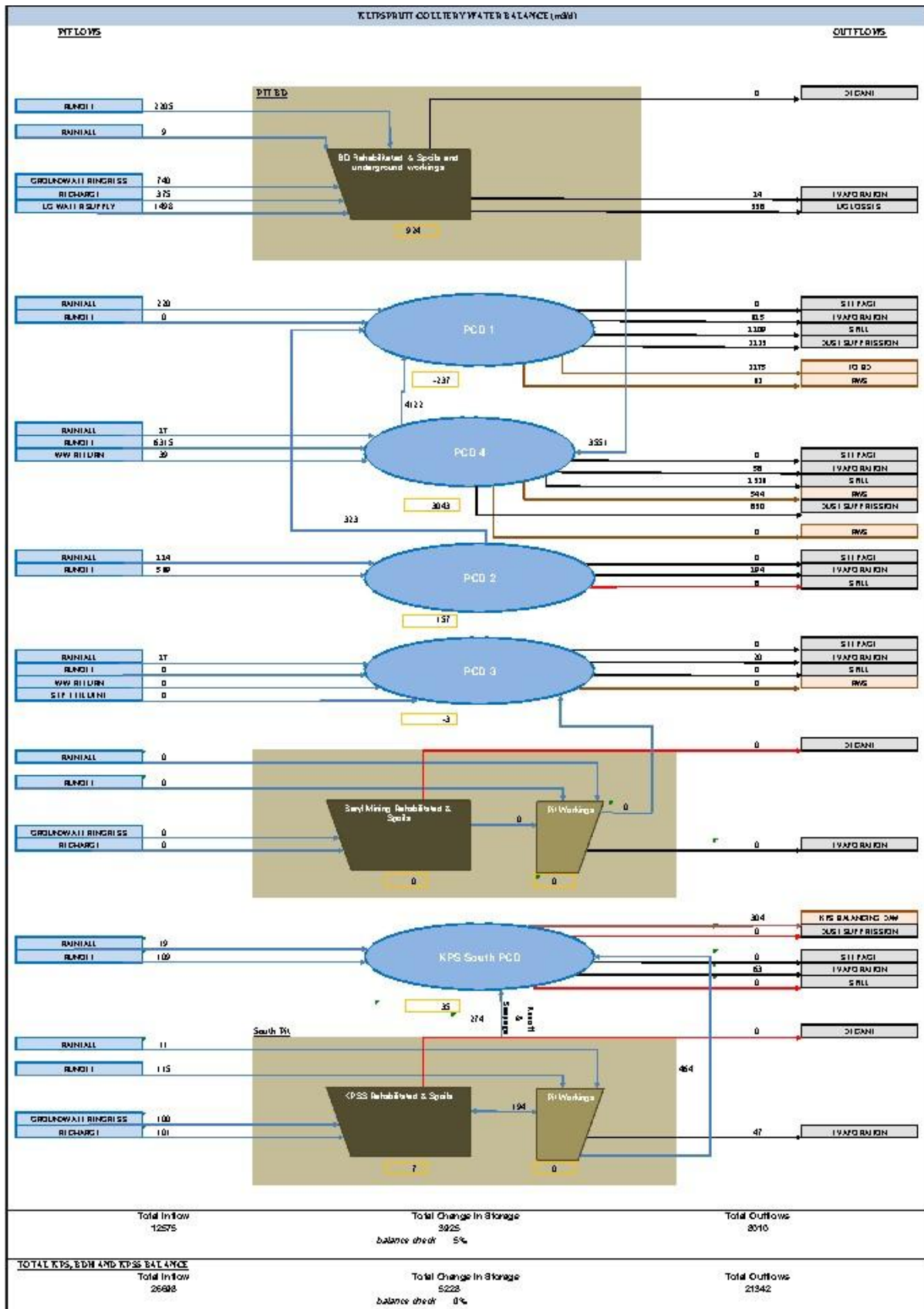


Figure 6-2: Annual average water balance results page 2 showing overall site water balance (KPSX/BD and KPSS areas)

### 6.3.2 Water Reticulation and infrastructure

The Klipspruit water reticulation system includes several dams and sump points. The Balancing Dam collects water from the pits and is utilized in mining operations. Additional water sources include the South Dam, Rubber Dam, and PCDs (Process Control Dams), which manage excess runoff and seepage from operational areas. The Water Treatment Plant at the site plays a crucial role in treating water for reuse, reducing the volume of excess water that requires management.

Below Figure 6-3 and Figure 6-4, the diagrams together provide a comprehensive overview of Klipspruit Colliery's water management system. Figure 6-3 illustrates the overall water flow across the site, including key infrastructure such as the Balancing Dam, PCDs, and various collection and pumping stations. It highlights how water is circulated for essential operational activities, such as dust suppression, firewater, and coal processing, and how excess water is managed to prevent overflows or contamination.

Figure 6-4 focuses in on the Pit BDH and Klipspruit South Pit (KPSS) areas, detailing the specific water reticulation within these zones. It shows the collection, storage, and transfer of water between PCDs and other water control structures, with a focus on dewatering operations and runoff management. Together, these figures illustrate the entire water reticulation network, ensuring efficient water use and mitigating environmental risks associated with excess water and runoff across the mine's operations.

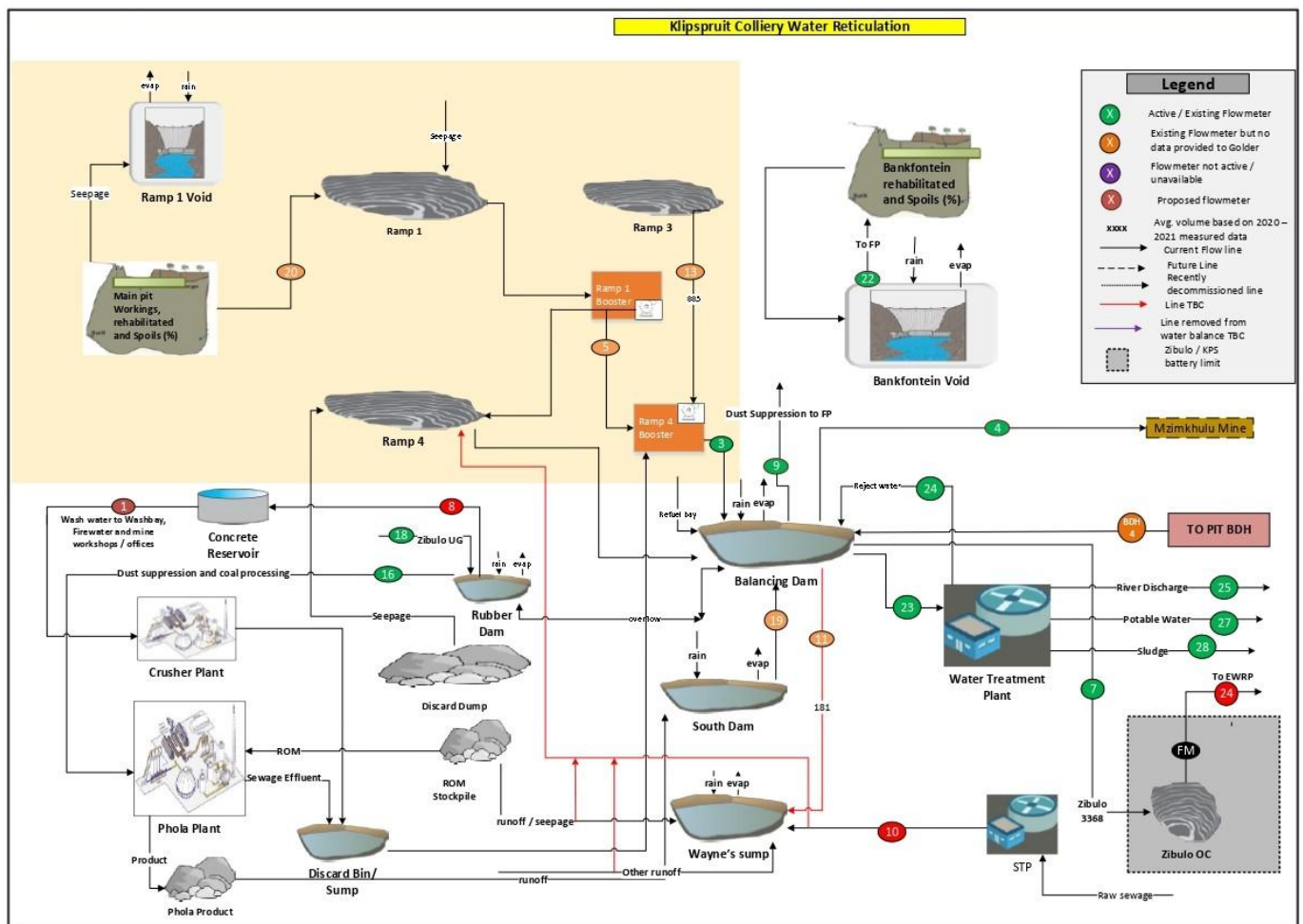


Figure 6-3: Klipspruit Water Reticulation System

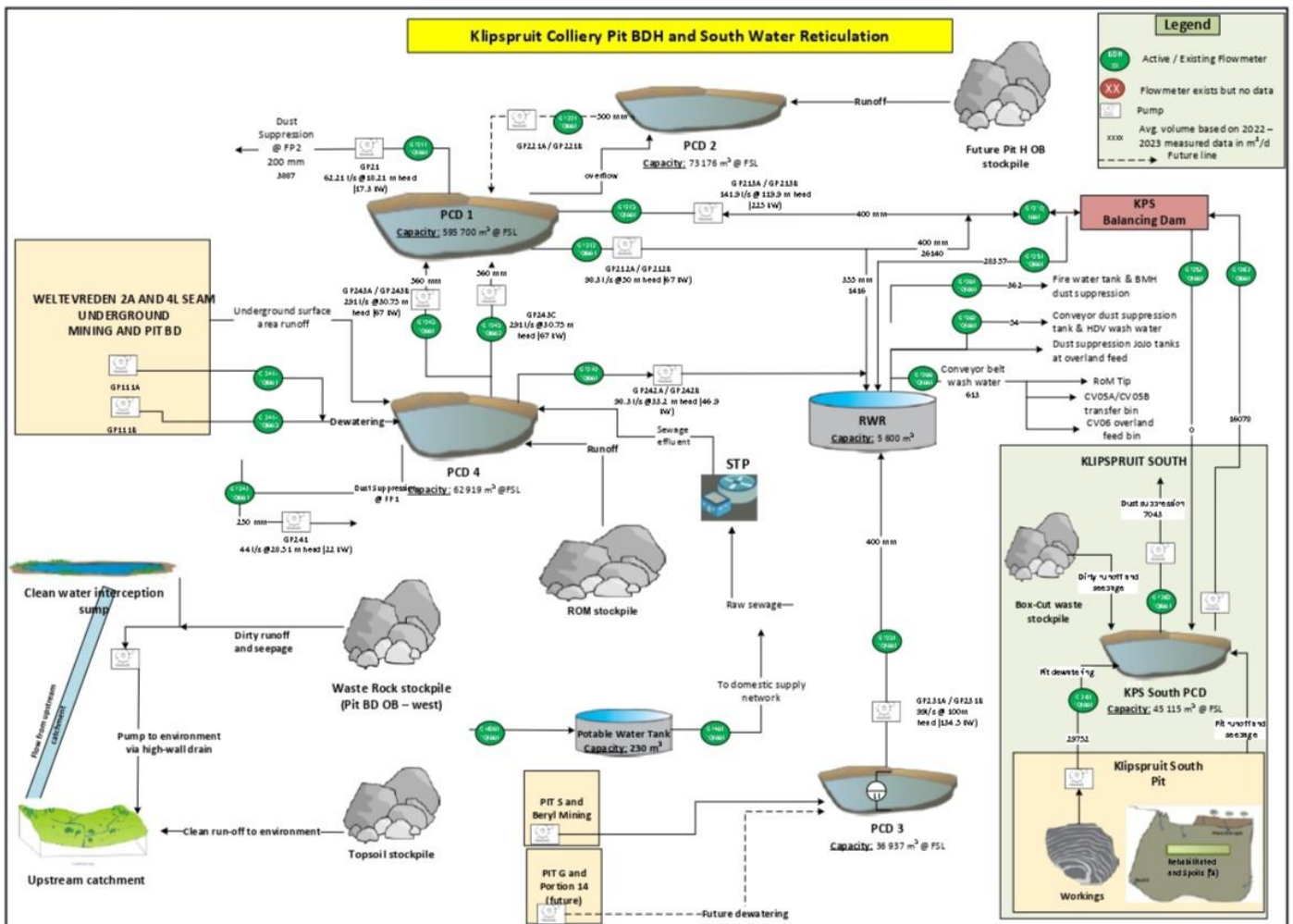


Figure 6-4: Pit BDH and KPSS water reticulation diagram

### 6.3.2.1.1 Water Infrastructure

This section should focus on water infrastructure that supports the reticulation and storage systems at Klipspruit.

#### Balancing Dam

The Balancing Dam is the main water collection facility on the site receiving water from the pits. Water from the Balancing Dam is used in the mining and for plant operations. The dam is an unlined homogeneous earth embankment dam (Jones and Wagener, 2017) (i.e. clay lined and not HDPE lined). The dam receives water from the dams at Pit BDH and the KPSS mining area.

The characteristics of the Balancing Dam are:

- 🌿 Design Capacity – 500 000 m<sup>3</sup>
- 🌿 Current operational maximum capacity due to siltation – 400 000 m<sup>3</sup>
- 🌿 Average operating level 50% and wet season operating level 70%.

- ☛ Water sources: Booster Tank 2, Rubber Dam, RoM sump, Discard bin sump, South Dam, PCD1, Pit BDH RWS, KPSS PCDs.
- ☛ Abstractions: Rubber Dam, dust suppression, water to the WTP, Mzimkhulu Mine, Zibulo Dam.

### Wayne's Sump

The filling point collection sump collects storm water run-off from the administration area. Water from this sump is used for dust suppression.

The characteristics of the sump are:

- ☛ Capacity: 25 000 m<sup>3</sup>.
- ☛ Water sources: Run-off from workshops and administration building areas, Sewage Treatment Plant discharge and Balancing Dam.
- ☛ Abstractions: Balancing Dam and dust suppression on haul roads

### Rubber Dam

Water from Zibulo Colliery reports to the Rubber Dam. The overflow from the dam is diverted to the Balancing Dam. The water from Rubber Dam is supplied to the PCPP.

The characteristics of the Rubber Dam are:

- ☛ Capacity: 10 000 m<sup>3</sup>. The dam is however operated at low volume due to dam wall failure.
- ☛ Water sources: Zibulo colliery
- ☛ Water Abstractions: PCPP, overflow to Balancing Dam

### Bankfontein Void

The void created by mining at Bankfontein has been used as storage since October 2018, the Bankfontein Pit had 100 255m<sup>3</sup> of water stored in the void. Under normal operation the void collects rainwater. Plans are to backfill the void within three years.

Table 6-2 and Table 6-3 provides a summary of all water storage facilities available at the KPS mining operation.

**Table 6-2: Summary of the water storage facilities**

Name	Surface Area (ha)	Original Capacity (m <sup>3</sup> )	Silted Percentage (%)	Dam Lining
Balancing Dam	8.5	500 000	18.4	Clay Lined
South Dam	3.93	40 000	5	Clay Lined
Discard bin sump	0.5	9000	0	Earth lined
RoM sump	1.1	25 000	0	HDPE Lined
Rubber Dam	0.45	10 000	0	HDPE Lined

**Table 6-3: Characteristics of the KPSX and KPSS dams**

Dam	Construction date	Closure date	Capacity (m <sup>3</sup> )	Water sources	Water Abstractions	Area @ FSL (m <sup>2</sup> )
<b>PCD 1</b>	2018  Compartment 1 commissioned 1 Jun-19  Compartment 2 commissioned 2 May-20	2044	571 931	Pit H dewatering (future source)  Rain  PCD 2 PCD 4  Raw Water Reservoir	Evaporation  Dust suppression / Filling Point  Raw Water Reservoir Balancing Dam	205 047
<b>PCD 2</b>	2021	2046	73 176	Pit H contaminated seepage and runoff (future source)  Rain  Overflow from PCD 1	Evaporation	126 903
<b>PCD 3</b>	2018	2044	36 937	Wash water return  Contaminated runoff from overburden and waste stockpile  Rain	Evaporation	19 239
<b>PCD 4</b>	2019	2045	62 919	RoM Tip sump Pit BD dewatering Runoff  Weltevreden 2A and 4L  Seam Underground Mining and Pit BD Sewage effluent	Raw Water Reservoir Evaporation PCD 1  Filling Point  Dust suppression	19 239

Dam	Construction date	Closure date	Capacity (m <sup>3</sup> )	Water sources	Water Abstractions	Area @ FSL (m <sup>2</sup> )
KPSS PCD	2019	2045	45 115	KPSS dewatering KPSS contaminated seepage and runoff Rain	Balancing Dam Evaporation	

### 6.3.3 Stormwater Management

The Water and Salt Balance model highlights the risk of stormwater overflow during peak rainfall periods, particularly at the Balancing Dam and PCDs. To mitigate this, the site has implemented a combination of water diversion, storage capacity increases, and water reuse strategies to manage excess water during high precipitation events. The storm water catchments for the KPS PCDs are shown in Table 6-4 and Table 6-5. The stormwater management strategies employed at Klipspruit Colliery by detailing the various catchment areas associated with each Process Control Dam (PCD) and outline the mechanisms used to manage runoff in different sections of the mine. Table 6-4 highlights the catchment areas, detailing their sizes, the percentage of runoff they generate, and how stormwater is collected and routed to the appropriate PCDs. This helps control and segregate stormwater into clean and dirty streams, ensuring that water used in operational areas (such as pits, stockpiles, and infrastructure) is captured for treatment and not allowed to mix with cleaner, uncontaminated water from surrounding areas. Table 6-5 continues this breakdown, expanding on additional catchment areas that manage stormwater runoff from different parts of the mine.

**Table 6-4: Storm water catchments for PCDs used in the model**

PCD	Catchment	Area [ha]	Runoff factor	Recharge factor
South Dam	Product stockpile area	40	0.16	0.4
Discard bin sump	Discard bin area	10.3	n/a	0.12 – 0.15
	PCPP RoM stockpile area	4.95 <sup>1</sup>	0.1	n/a
	KPS RoM stockpile area	16	0.1	n/a
	Crusher Plant area	28.54 <sup>1</sup>	0.7	n/a
RoM sump	Offices and workshop area	7.79 <sup>1</sup>	0.7	n/a

**Notes:** 1 – Areas updated by site in 2024

**Table 6-5: Storm water catchments for PCDs used in the model**

Catchment	Mining area	Area [ha]	Flows to	Runoff factor	Recharge factor
Overburden dump	BD (	59.091	PCD2	0.1 – 0.15	0.12 – 0.15
	KPSS	18.191	KPSS PCD	0.1 – 0.15	0.12 – 0.15
RoM conveyor Tip area	Pit BD	6.21	PCD3	0.6	n/a
Emergency RoM stockpile	Pit BD	9.81	PCD4	0.1 – 0.15	0.12 – 0.15
HDV parking area	Pit BD	9.421	PCD4	0.8	n/a
Silo area	Pit BD	4.3	PCD4	0.6	n/a
Building terrace	Pit BD	11.91	PCD4	0.7	n/a
Pit BD road (tar road)	Pit BD	3.181	PCD4	0.7	n/a
Haul road (access road for Blue mining)	Pit BD	10.241	PCD4	0.7	n/a
Haul road	Pit BD	22.161	PCD2	0.7	n/a
Pit KPSS road	KPSS	16.881	KPSS PCD	0.7	n/a



Figure 6-5: Pit BD roads area



Figure 6-6: KPSS road area



Figure 6-7: ROM conveyor tip area



Figure 6-8: Emergency ROM stockpile area



Figure 6-9: Building Terrace



Figure 6-10: HDV parking area



Figure 6-11: PCD1 overburden stockpile

### 6.3.4 Water Quality

The purpose of the salt balance is to assess the impacts from the Klipspruit mining operation on the surface water resource. This is done by calculating the salt loads for the various water streams from the Klipspruit operation. The salt balance will focus on Total Dissolved Salts (TDS) only. The methodology for conducting the salt balance is based on utilising the measured TDS concentration as obtained from the site monitoring plan as initial estimates of salt concentration. The average and 95th percentile of the TDS concentrations recorded at Klipspruit are shown in Table 6-6. The TDS compliance limit for the discharge into the surface water resource is 450 mg/l.

Table 6-6: Average and 95th percentile values of measured TDS concentrations (January 2023 – December 2023) for various sample points

Facilities	Recorded TDS concentration (mg/l)		Recorded SO4 concentration (mg/l)		Recorded Na concentration (mg/l)	
	Average	95th percentile	Average	95th percentile	Average	95th percentile
Balancing dam	3336	4002	2315	2935	135	190
South dam	3749	4172	2475	2859	360	401
Ramp 1	3981	4448	2672	2859	74	85
Ramp 1 Void	3821	4296	2679	2786	54	59
Bankfontein Dam	2948	3246	1955	2140	64	72
Ramp 4 Sump	-	-	-	-	-	-
KPSX PCD 2 Spillway	1420 (only one reading on 25 July during the period)	-	-	-	-	-
KPSX PCD 4 Spill Way	1331	1448	797	932	27	30
N12 Discharge Canal	701	608	384	309	36	34

Facilities	Recorded TDS concentration (mg/l)		Recorded SO4 concentration (mg/l)		Recorded Na concentration (mg/l)	
	Average	95th percentile	Average	95th percentile	Average	95th percentile
N12 Discharge Canal 2	3735	4038	2439	2682	57	61
Raw Effluent	-	-	-	-	-	-
Final Effluent	-	-	-	-	221	301
KPSX WWTP Final	-	-	-	-	201	302
South Pit PCD	2146	3302	1265	2396	66	96
Clean Canal	339	418	152	190	12	14
Rubber Dam (Zibulo UG)	3707	4380	2267	2818	131	152
KPSX PCD 1	1270	1406	798	886	28	30
KPSX PCD 2	1824	2752	1141	1790	30	39
KPSX PCD 3	479	552	189	200	14	15
KPSX PCD 4	1460	1760	908	999	37	54

### 6.3.5 Groundwater and Post-Closure Water Management

Post-closure water management at Klipspruit Colliery focuses on addressing groundwater ingress and surface water decant. The WSB model projects that decant from the Main Pit will continue for decades post-closure, reaching a maximum of 2 750 m<sup>3</sup>/day. Strategies such as rehabilitation of pits, continuous groundwater monitoring, and the implementation of water treatment facilities are recommended to mitigate the environmental impacts of decant water. Groundwater ingress into the Weltevreden 4L- and 2A- seam workings are taken from the Klipspruit Colliery Geohydrological Assessment: Groundwater Model Report (WSP, 2024). Refer to Figure 6-12 for the graphical representation and Table 6-7 for the associated data.

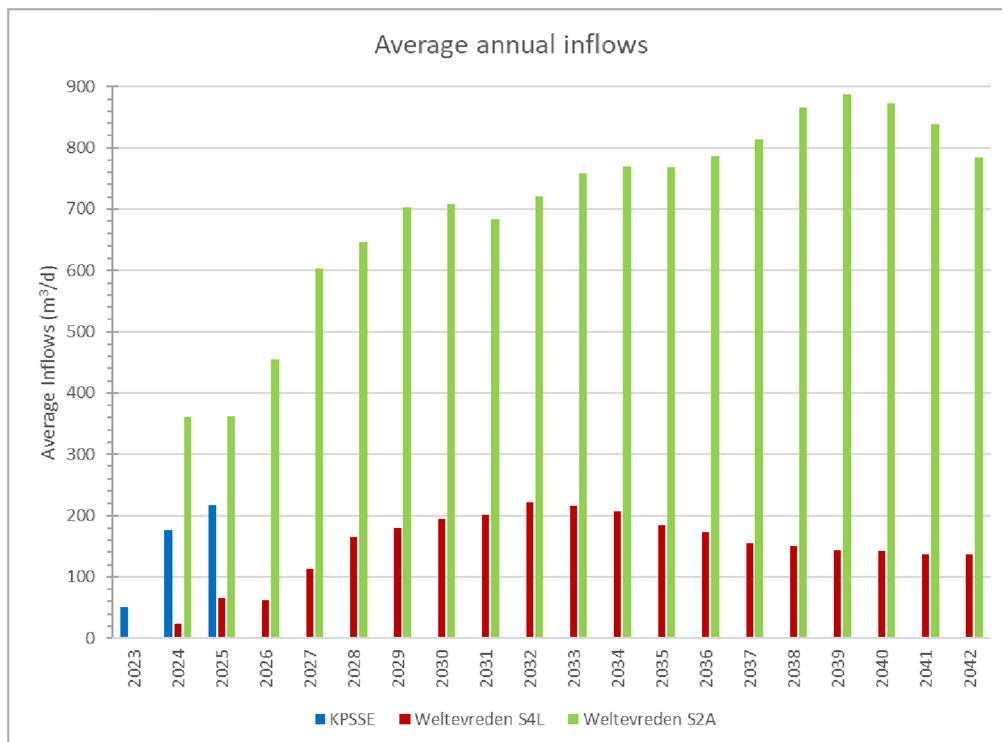


Figure 6-12: GW ingress volumes to be used in the model

**Table 6-7: Groundwater inflows into the underground mining operation**

Year	KPSSE (m3/d)	Weltevreden S24L (m3/d)	Weltevreden S2A (m3/d)
2024	175.7	23	360.1
2025	217.8	64.8	362.6
2026	-	62.5	454.6
2027	-	112.1	603.4
2028	-	165.8	645.8
2029	-	180.4	703.2
2030	-	193.7	708
2031	-	201.3	684
2032	-	221.6	720.8
2033	-	215.1	758.3
2034	-	207	770.7
2035	-	185	769.2
2036	-	172.9	785.8
2037	-	155	814.2
2038	-	150.6	866.9
2039	-	144.2	888.1
2040	-	141.4	872.5
2041	-	137.5	838.6
2042	-	136.9	785.1

### 6.3.6 Recommendations and Action Plan

The WSB recommends increasing water reuse within the operations to minimize excess water. A focus on proactive monitoring of groundwater ingress and decant locations will be essential, particularly in the post-closure phase. Treatment systems should be designed to handle the projected decant volumes, and contingency plans for dam spillages must be updated regularly.

## 6.4 Operational Management

### 6.4.1 Organisational Structure

KPS's organisational structure has been discussed in sub-section 2.7. The structure includes the necessary capacity to ensure the implementation of the EMP and the findings and recommendations of this IWULA and the likely conditions to be attached to the issued WUL.

### 6.4.2 Resources and Competence

Although a large workforce will be required for the construction phase of the project, as well as for the operational phase, this workforce will consist largely of current employees employed at the KPS, although the opportunities will be limited. This will enable some current employees to retain their jobs.

The project will make use of temporary labour for the construction phase of the project, including semi-skilled and unskilled labour, primary related to machine operators, artisans and housekeeping. In terms of the operational workforce, the proponent anticipates the use of existing employees who will be transferred from the current operations to the proposed operations associated with the project.

Expenditure forecasts for the project are currently unknown at this stage, however, it is foreseen that the current procurement processes and plans in place for the existing KPS will be continued into the development of the KPSX Project. In this regard, Seriti Power is committed to maximising the use of local services, where feasible.

The management level would include managers for the Health, Safety and Environment, while skilled staff would include field technical personnel. These staff would be responsible for ensuring the implementation of the requirements of this IWWMP.

### 6.4.3 Education and Training

An Environmental Awareness Plan was developed for KPS and will be implemented for KPSX. The Environmental Awareness Plan describes the manner in which the mine intends to inform its employees of any environmental risks that may result from their work and the manner in which the risk must be dealt with to avoid pollution or degradation to the environment including water related resources.

Environmental conditions are included in all operational contracts, thereby making contractors aware of the potential environmental risks associated with the Project and the necessity to prevent accidental spillages by implementing good housekeeping practises.

The following principles will apply to the Environmental Awareness Plan (Safety, Health and Environmental (SHE) Training) for KPSX:

- 🌱 All personnel will, as a minimum, undergo general SHE induction and awareness training;
- 🌱 An Environmental Control Officer (ECO) will be appointed;
- 🌱 The ECO will identify the SHE training requirements for all KPSX personnel and contractors. The training requirements will be recorded in a training needs matrix indicating particular training that must be undertaken by the identified personnel and contractors. The training matrix will be administered by the ECO; and
- 🌱 Development of a training programme.

## 6.5 Monitoring and Control

### 6.5.1 Surface Water Monitoring

A monitoring programme is essential as a management tool to detect negative impacts as they arise and to ensure that the necessary mitigation measures are implemented. The monitoring programme has been reviewed and aligned with the updated Surface Water Impact Assessment, Hydrogeological Impact Assessment and Storm Water Management Plan to ensure that monitoring locations, parameters and frequencies are appropriate to detect potential impacts associated with stormwater runoff, groundwater ingress, mine-affected water and post-closure groundwater rebound.

A monitoring program is used as an early detection tool for surface water quality and is used to determine when mitigation must be implemented. Monitoring should be implemented throughout the life of mine. The impacts on water quality will be determined by benchmarking the monitoring data against the Wilge Interim RWQO. The surface water monitoring locations include a combination of upstream reference points, downstream compliance points and locations associated with stormwater discharge pathways to enable differentiation between background conditions and potential mining-related influences. Monitoring results are used to assess the

effectiveness of stormwater management controls and to trigger corrective actions where deviations from baseline or target conditions are identified.

Description of the sampling locations have been provided in Table 6-8. The water samples collected as grab samples during the site visit were submitted to Aquatico Laboratory, a South African National Accreditation System (SANAS) accredited laboratory for analysis.

**Table 6-8: Surface Monitoring Locations**

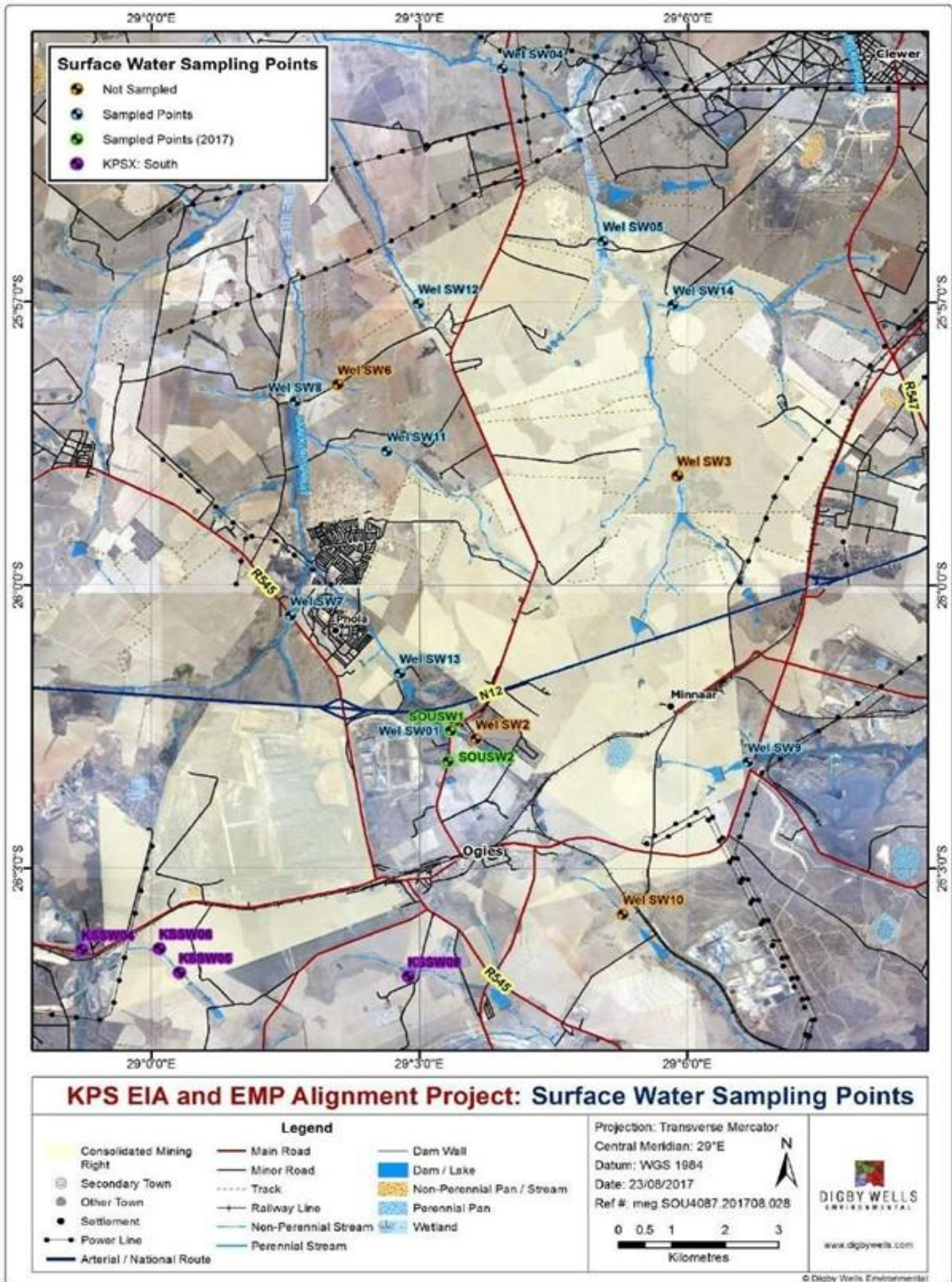
Sampling Location	Latitude	Longitude
Wel SW1	-26.025775	29.055752
Wel SW2	-26.027222	29.0605
Wel SW3	-25.980711	29.098048
Wel SW4	-25.90878	29.065413
Wel SW5	-25.939296	29.084138
Wel SW6	-25.964583	29.03475
Wel SW7	-26.005463	29.025901
Wel SW8	-25.967573	29.026982
Wel SW9	-26.031298	29.111296
Wel SW10	-26.058155	29.087963
Wel SW11	-25.97636	29.043834
Wel SW12	-25.950329	29.049746
Wel SW13	-26.01562	29.046318
Wel SW14	-25.95048	29.097253
SOUSW1	-26.025774	29.055818
SOUSW2	-26.031186	29.055347

\*(Reference Coordinate System as WGS: 84 Geographic System)

The variables analysed in the laboratory are listed in Table 16 below. The water quality results were benchmarked against the Wilge IRWQO.

**Table 6-9: Variables analysed in the laboratory**

Total Dissolved Solids	Nitrate NO <sub>3</sub> as N	Potassium as K	Electrical Conductivity (EC)
Sulfate as SO <sub>4</sub>	Fluoride as F	Chlorides as Cl	Total Alkalinity as CaCO <sub>3</sub> (Alk)
Sodium as Na	Calcium as Ca	Iron as Fe	pH-Value at 25°C
Magnesium as Mg	Free and Saline Ammonia as N	Manganese as Mn	Electrical Conductivity (EC)
Aluminum as Al			



### Figure 6-13: Surface Water Monitoring Points

#### 6.5.2 Groundwater levels and water sampling

Groundwater levels must be recorded on a monthly basis to detect any changes or trends in groundwater elevation and flow direction.

When sampling, the following procedures are proposed:

- One litre plastic bottle with a cap is required for the sampling exercises;
- Glass bottles are required if organic constituents are to be tested;
- Collected samples must be stored in cooler box or fridge while on site; and
- Sample bottles should be marked clearly with the borehole name, date of sampling, sampling depth and the sampler's name and submitted to a SANAS accredited laboratory.

Prior to collecting a sample, the borehole should be purged. Purging is done to remove stagnant water within the borehole therefore acquiring a sample representative of the local groundwater. Stagnant water may be of altered chemistry due to extensive exposure to air and borehole casing material. Purging can be done using a bailer or a small pump. While purging, field chemistry (pH, EC, TDS or Dissolved Oxygen (DO)) should be monitored using handheld apparatus. Handheld apparatus should be calibrated prior to sampling. A sample may then be collected as soon as the selected field chemistry reaches stability. Groundwater level monitoring is required to track predicted drawdown associated with underground mining activities, to confirm the extent of groundwater level changes over time, and to support assessment of groundwater–surface water interactions, including potential impacts on wetlands and drainage features.

#### 6.5.3 Sampling frequency

Groundwater is a slow-moving medium and drastic changes in the groundwater composition are not normally encountered within days. Considering the proximity of private boreholes and streams to the proposed mine, monitoring should be conducted monthly to reflect influences of wet and dry seasons. The sampling frequency could be adjusted following the trend analysis.

Samples should be collected by using best practice guidelines and should be analysed by a SANAS accredited laboratory. It is suggested that monthly samples be collected, extending up to two years post closure and based on the result trends it can be extended for up to 30 years or steady state situation prevails. Post closure monitoring should continue until a sustainable situation is reached and after it has been signed off by the authorities. Monitoring frequency may be increased where trend analysis indicates deterioration in water quality, increasing groundwater drawdown, or potential impacts to surface water and wetland receptors, with adaptive management measures implemented in consultation with the relevant authorities.

#### 6.5.4 Parameters

Groundwater sampling and analysis is currently conducted by Aquatico. All samples collected are submitted to the Laboratory for the determination of all monitoring parameters. The following parameters form part of sampling and laboratory analysis for Klipspruit Colliery.

**Table 6-10: Monitoring Parameters**

Parameters	Parameters
pH	Na mg/l
EC mS/m	Al mg/l
TDS mg/l	Fe mg/l
TotHardness mg/l	Mn mg/l
MALK CaCO <sub>3</sub> /L	Zn mg/l
Cl mg/l	Si mg/l
SO <sub>4</sub> mg/l	SS mg/l
PO <sub>4</sub> mg/l	Turbidity NTU
N_Ammonium mg/l	Free Cl <sub>2</sub> mg/l
NO <sub>3</sub> -N mg/l	LSI (Index)
NO <sub>2</sub> -N mg/l	SAR
TON mg/l	CaHardness mg/l
F mg/l	MgHardness mg/l
Ca mg/l	Bicarbalk CaCO <sub>3</sub> mg/l
K mg/l	Carbalk mg/l
Mg mg/l	Halk mg/l

The selected monitoring parameters are representative of potential mine-related contaminant including salinity, nutrients, metals and acid mine drainage indicators, and are consistent with the parameters assessed in the specialist studies and relevant DWS water quality guidelines. The groundwater and surface water monitoring parameter suite will be reviewed periodically based on monitoring results, evolving risk profiles and regulatory requirements, to ensure continued relevance and effectiveness of the monitoring programme.

## 7 Water and Waste Management

### 7.1 Water and Waste Management Philosophy (process water, storm water, groundwater, waste)

Seriti Power developed a waste management plan in 2009 with the intent to provide guidance and to provide performance requirements for effective waste management from cradle to grave. This plan is aligned with Seriti Power's Sustainability Policy, other standard operating procedure documents and the relevant South African waste legislation. The plan emphasises pollution prevention from source by reducing, re-using and recycling and outlines the responsibilities for each level of staff employed at Seriti Power.

#### 7.1.1 Water Management

The general principle of water management is the recognition that water is a scarce resource. Water and waste management systems will be introduced on the site to ensure that potential pollution of the water resources will be minimised. This in turn leads to the other principles and are listed below:

-  Water use minimisation (water conservation) or re-use of water and pollution prevention or the limitation of pollution of water;

- ✔ All water that can be kept clean will be kept clean, and dirty water areas will be minimised
- ✔ The use of water resources for processing and mining activities will constantly be evaluated to ensure that their use is optimised;
- ✔ No water will be discharged into the environment unless authorised by DWS especially water that exceeds the catchments water quality objectives, as set by the National Authority, with the exception of emergency conditions if safety should demand so; and
- ✔ Dirty water catchments will be minimised and kept separate from clean catchments and all water contained here shall be re-used in the plant, thus reducing the quantity of raw water extracted.

All the relevant principles contained in DWS's BPG will be utilised for all designs and management practises. The mine will also ensure compliance with GN 704 of the NWA.

The proposed storm water controls are described in the section below. The storm water controls required to collect contaminated storm water will consist of open concrete lined and/or pipe systems. The clean water controls required to divert clean water away from the mine infrastructure includes the construction of bunds and unlined canals. The pond is sized for the 1:50 year storm volume (design storms yielding higher volumes will apply). Any volume in excess of the 1:50 year event will spill into the environment

### 7.1.2 Waste Management

The waste management philosophy is the core strategy of waste prevention, minimisation, reuse, recycling, energy recovery and final disposal. This is firmly established as a driving principle elsewhere. Effective and optimal waste management for the KPSX Project is addressed through the process of ensuring the collection, transport, processing and disposal waste system is in place.

According to NEM: WA, the following measures should be implemented:

- ✔ Avoid the generation of waste and where such generation cannot be avoided to minimise the toxicity and amounts of waste that are generated;
- ✔ Reduce, re-use, recycle and recover waste;
- ✔ Where it must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;
- ✔ Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;
- ✔ Prevent any employee or any person under his or her supervision from contravening the Act; and
- ✔ Prevent the waste from being used for an unauthorised purpose.

Waste will be separated at its source and contained in appropriately labelled containers specifying the type of waste and its specific handling requirements. General waste will be collected in waste skips and will be removed by an appointed contractor and disposed of at the local municipal waste site. Hazardous waste, such as hydrocarbons and hydrocarbon contaminated material, will be stored

in separate drums or waste skips in banded areas and will be removed and disposed of by reputable contractors. Where possible, the recycling of glass, paper, cans, oil and scrap waste will be implemented through collaboration with recycling companies.

All contaminated water will be contained in the PCDs adjacent to the pit and stockpiles before being pumped via pipelines to the PCD at the KPS. The water contained in the PCD at the KPS will be used as recycled water during the beneficiation process and for dust suppression.

## 7.2 Strategies (process water, storm water, groundwater and waste)

The water management strategies for the Unwabu underground expansion have been designed to align with the existing Klipspruit water management system and the detailed Storm Water Management Plan for Pits BD and H. These strategies ensure protection of the water resource, compliance with GN704, and efficient use of water across the operation. Because the Unwabu project introduces no new surface infrastructure, the focus remains on optimising the performance of established systems to manage clean water, dirty water, process water, groundwater ingress and associated wastes.

The strategies below integrate the findings of the SWMP hydrological modelling, particularly the catchment delineation, clean/dirty water separation, peak flow estimations, berm and channel layouts and containment requirements.

### 7.2.1 Clean Water Management

Clean water management is centred on preventing uncontaminated runoff from entering disturbed or operational areas, thereby avoiding unnecessary contamination and reducing the volume of water requiring containment as dirty water. The approach for the Unwabu BD/H underground expansion is consistent with GN704 principles and the updated SWMP designs.

#### 7.2.1.1 Clean Water Diversion and Separation

The clean water system is designed to route all non-impacted runoff away from mining areas through engineered diversion channels, berms and natural overland flow paths. For Pit BD, the upgraded clean channel system, redesigned to convey 1:50-year peak flows as per the SWMP, directs clean runoff northward into natural drainage without intersecting disturbed ground. Channel sizing (including 2–4 m base widths and velocities within non-erosive ranges) reflects the hydrological modelling results

At Pit H, a clean-water separation berm encircles the pit to prevent radial overland flow from entering the mining footprint. Because Pit H is located at a topographical high point, runoff naturally drains away, requiring only a perimeter berm to maintain clean/dirty separation.

#### 7.2.1.2 Protection of Natural Drainage Features

The clean water system discharges into existing undisturbed drainage lines, ensuring natural hydrological patterns are maintained. No diversions, realignments or in-stream works are proposed, consistent with the underground-only nature of the project.

### 7.2.1.3 *Minimising Contact Between Clean Water and Disturbed Surfaces*

All haul roads, stockpiles and working areas associated with BD/H are already enclosed within the Klipspruit dirty water footprint. Clean water is routed around these through diversion berms and channels, preventing unnecessary contact and ensuring that PCD capacity is preserved for groundwater ingress and dirty-water accumulation.

## 7.2.2 **Dirty Water Management**

Dirty water management focuses on controlling runoff from disturbed areas, groundwater ingress from underground operations, and any water that may carry sediment or contaminants such as suspended solids or hydrocarbons. All dirty water generated at BD/H must be collected, conveyed and contained in accordance with GN704 and the SWMP.

### 7.2.2.1 *Capture, Containment and Routing of Dirty Water*

Dirty water is confined to the designated dirty-water catchments identified in the SWMP. In Pit BD, dirty water is routed into engineered concrete and trapezoidal channels (C6–C11), designed to convey peak flows safely to the dirty-water sump and onward to PCD3. For Pit H, the dirty-water footprint is limited to the pit itself, where runoff and groundwater ingress accumulate in the pit sump before being pumped to PCD1.

Hydrological modelling confirms the required containment volumes—297 290 m<sup>3</sup> for BD and 128 450 m<sup>3</sup> for H—for a 1:50-year event

### 7.2.2.2 *Pollution Control Dams (PCDs)*

Dirty water from:

- ✔ Pit BD is directed to PCD3,
- ✔ Pit H is directed to PCD1,
- ✔ Groundwater ingress is pumped to PCD4 before reuse.

These PCDs are existing components of the Klipspruit dirty-water system. They are operated under a zero-effluent discharge philosophy, ensuring no contaminated water enters the surrounding environment.

### 7.2.2.3 *Sumps and Pumping Systems*

Dirty water generated in both BD and H accumulates in in-pit sumps strategically located at the lowest points of each pit. The sumps:

- ✔ Buffer peak inflows,
- ✔ Support staged pumping into the PCD system,
- ✔ Provide operational flexibility during high-rainfall periods.

Pit BD includes an additional sump at the southwestern flank to intercept dirty water generated from access roads and bermed areas, preventing uncontrolled entry into rehabilitating surfaces.

#### **7.2.2.4 Infrastructure Integrity and Erosion Control**

Dirty-water channels are lined (concrete or stabilised earth) to ensure that high-velocity flows predicted by the hydrological model do not erode channel beds or berms. The SWMP recommends reducing slopes of channels C6–C11 to 0.002 m/m to stabilise velocities and minimise erosion risk

#### **7.2.2.5 Zero Discharge and Reuse of Dirty Water**

All dirty water is reused within operational processes including:

- ☛ Dust suppression on haul roads,
- ☛ Plant and equipment washing,
- ☛ Underground mining operations.

This ensures compliance with GN704 and reduces dependence on fresh water sources.

#### **7.2.2.6 Monitoring, Inspections and Adaptive Management**

Dirty water volumes, PCD storage levels, sump performance and channel integrity are monitored continuously. Post-storm inspections ensure that berms, channels and sumps function as designed, and that no overflow or breaching occurs. Any deviation from design performance triggers corrective action, including redesign or reinforcement.

##### **7.2.2.6.1 Groundwater Management Strategy**

Groundwater management for the Unwabu underground expansion focuses on controlling inflows into the BD and H underground workings, safeguarding water quality, protecting wetland hydrology, and ensuring that dewatering activities remain within authorised limits. The strategy is supported by the existing Klipspruit groundwater monitoring network and the dewatering infrastructure connected to PCD4.

##### **7.2.2.6.2 Management of Groundwater Ingress**

Groundwater ingress into the BD and H underground workings will be intercepted through the existing network of underground sumps, pipelines and rising mains. All intercepted water is pumped to surface and directed into the authorised dirty-water reticulation system.

This ensures:

- ☛ no uncontrolled discharge,
- ☛ full containment within PCD4, and
- ☛ alignment with the zero-effluent philosophy of the mine.

The rate of ingress is monitored through calibrated flow meters and operational logs, enabling early detection of changes in hydrogeological conditions.

#### 7.2.2.6.3 Protection of Watercourse and Wetland Integrity

The BD/H underground workings extend beneath the regulated areas of hillslope seepage and valley-bottom wetlands. Although the mining is entirely subsurface, the strategy prioritises protection of wetland ecological condition by:

- ☛ monitoring groundwater levels in boreholes located within and adjacent to wetland influence zones,
- ☛ detecting drawdown patterns to assess any potential reduction in baseflow or wetland hydrogeological function,
- ☛ adapting dewatering rates or support measures if monitoring indicates deviation from expected hydrological behaviour.

These actions ensure alignment with NEM:BA ecological protection obligations and Section 21(c) and (i) water use authorisation requirements.

#### 7.2.2.6.4 Groundwater Quality Protection

All groundwater quality data will be evaluated against baseline conditions and WUL limits. By routing all pumped groundwater to PCD4, the system minimises the risk of:

- ☛ contamination of natural aquifers,
- ☛ uncontrolled release,
- ☛ degradation of downstream water quality.

Should any upward trend in contaminants be detected, a risk-based investigative sampling protocol will be implemented.

#### 7.2.2.6.5 Long-term Hydrogeological Stability

The bord-and-pillar mining layout ensures structural stability and minimises risk of subsidence or preferential flow pathways. Closure planning includes:

- ☛ modelling of groundwater rebound,
- ☛ estimating the duration of post-closure monitoring,
- ☛ assessing water quality changes during aquifer recovery,
- ☛ ensuring that rebound does not mobilise contaminants.

This strategy ensures that post-closure groundwater behaviour remains predictable and environmentally acceptable.

### 7.2.3 **Process Water Management Strategy**

Process water management aims to maximise reuse, minimise freshwater intake and ensure that all operational water remains within authorised circuits. The underground expansion generates no new process water streams; however, it influences the overall water balance through dewatering inflows.

### 7.2.3.1 *Integration of Underground Dewatering into Process Circuits*

All water pumped from BD/H is transferred to PCD4, from where it is reused in:

- ☛ dust suppression,
- ☛ underground operational activities,
- ☛ plant and equipment washing,
- ☛ occasional supplementation to the Phola Coal Processing Plant (if authorised).

This integration significantly reduces reliance on external water sources and contributes to compliance with water efficiency targets.

### 7.2.3.2 *Optimisation of Water Reuse*

The Klipspruit operation follows a zero-effluent philosophy; therefore, process water is continually recirculated. The strategy ensures:

- ☛ consistent recycling of PCD water,
- ☛ minimisation of evaporative losses,
- ☛ efficient matching of water quality to appropriate operational uses.

Where required, minor treatment steps (e.g. sediment settling) are applied before reuse.

### 7.2.3.3 *Control of Water Quality in Process Streams*

Quality monitoring of process circuits ensures that:

- ☛ salinity, pH, TDS and sulphate concentrations remain within acceptable internal limits,
- ☛ water quality does not compromise plant or underground equipment performance,
- ☛ any deterioration in water quality is rectified through dilution, controlled release to PCDs or alternative internal routing.

This supports both operational efficiency and environmental compliance.

### 7.2.3.4 *Infrastructure Operation and Maintenance*

All pumps, pipelines, valves and sumps are subject to scheduled maintenance. Failures in process-water routing can lead to uncontrolled dirty-water accumulation, so proactive maintenance is an essential component of the strategy.

## 7.2.4 *Waste Management Strategy*

Waste management for the Unwabu underground expansion aligns with NEM:WA and the Klipspruit EMPr. The project generates no new residue facilities or stockpiles; however, underground mining does produce operational wastes that must be managed appropriately.

### 7.2.4.1 *General and Hazardous Waste Handling*

Underground operations generate:

- ☛ hydrocarbon-contaminated materials,
- ☛ used oils and lubricants,
- ☛ chemical containers,
- ☛ spent filters,
- ☛ scrap metal and general domestic waste.

These wastes are collected at designated points underground, transferred to surface in sealed containers and managed in accordance with:

- ☛ NEM:WA,
- ☛ the Waste Classification and Management Regulations,
- ☛ site-specific waste-handling procedures.

Hazardous waste is disposed of only at licensed facilities, with disposal certificates retained for audit.

#### **7.2.4.2 Wastewater and Hydrocarbon Management**

Workshops, pump stations and lubrication areas generate wastewater that may contain hydrocarbons. This wastewater is processed through oily water separators before being directed to the dirty-water system. The strategy ensures:

- ☛ separation of free-phase hydrocarbons,
- ☛ prevention of diesel/oil entering the groundwater or clean-water systems,
- ☛ compliance with duty-of-care obligations.

#### **7.2.4.3 No New Residue Deposits or Stockpiles**

The BD/H underground expansion does not create:

- ☛ new dumps,
- ☛ new residue stockpiles,
- ☛ discard facilities,
- ☛ new contaminated footprint areas.

Waste generated will therefore not expand the environmental footprint of the operation.

#### **7.2.4.4 Monitoring and Documentation**

Formal waste registers track:

- ☛ quantities of waste generated,

- classification and manifesting,
- transport logs,
- disposal certificates.

This ensures regulatory compliance and supports internal audits.

**Table 7-1: Integrated Strategy Summary Table**

Strategy Theme	Objective	Key Measures	Performance Outcome
<b>Clean Water Management</b>	To protect natural runoff and prevent contamination of clean water systems.	Clean water is diverted away from operational areas using engineered berms and diversion channels designed for the 1:50-year event. Clean runoff is directed into natural drainage lines and kept separate from mining-disturbed areas by maintaining perimeter berms, protecting drainage paths, and ensuring that clean water does not enter the BD or H operational footprints.	Clean and dirty water are effectively separated in compliance with GN704 requirements, clean runoff remains uncontaminated, and downstream ecosystems—including the Saalboomspruit—are protected.
<b>Dirty Water Management</b>	To ensure contaminated water is fully contained and does not enter the environment.	Dirty water generated in BD and H is intercepted within designated dirty-water catchments and sumps, transferred to PCD 3 (BD) and PCD 1 (H), and stored in facilities with sufficient capacity as defined in the SWMP. Dirty-water infrastructure, including sumps, channels, and pumps, is maintained to ensure full containment and functional stormwater and groundwater handling.	The mine maintains a zero-discharge status, contaminated water remains fully contained, and the PCD system operates within designed capacity limits in accordance with GN704 and the WUL.
<b>Process Water Management</b>	To maximise internal reuse and reduce reliance on external freshwater sources.	Water pumped from underground workings is integrated into the Klipspruit process water circuit via PCD4. Process water is reused for dust suppression, equipment washing, and other approved operational purposes. The water balance is updated regularly to ensure efficient use of mine-affected water and alignment with operational requirements.	Reduced freshwater abstraction, optimised reuse of affected water, and improved operational water efficiency aligned with national water conservation objectives.
<b>Groundwater Management</b>	To prevent contamination and manage drawdown associated with underground dewatering.	Groundwater ingress to BD and H workings is collected through underground sumps and pumped to PCD4 for containment. Groundwater monitoring boreholes track water	Groundwater impacts remain within predicted limits, wetland hydrology is protected, and long-term aquifer

Strategy Theme	Objective	Key Measures	Performance Outcome
		levels and quality in relation to baseline conditions, particularly within wetland influence zones. Any deviations trigger further investigation and adaptive management.	stability is maintained in accordance with WUL and EMPr requirements.
<b>Stormwater Management</b>	To manage peak stormwater flows and ensure infrastructure stability and compliance.	Stormwater systems are operated and maintained according to the SWMP, including use of trapezoidal and lined channels, constructed berms, stable outlet structures, and erosion-resistant designs. Stormwater controls are inspected and maintained to preserve hydraulic functionality and protect infrastructure during high-flow events.	Reduced erosion, stable stormwater control infrastructure, effective flood attenuation, and compliance with GN704 stormwater requirements.
<b>Waste and Residue Management</b>	To ensure environmentally compliant handling, storage and disposal of all waste streams.	Waste generated by underground operations is segregated, handled and removed to surface in sealed containers. Hazardous waste is managed in accordance with NEM:WA and disposed of at licensed facilities. No new stockpiles or residue deposits are created by the project, and existing systems are used for waste handling and recordkeeping.	Waste is managed in full compliance with regulatory requirements, pollution risks are minimised, and clean/dirty water separation remains uncompromised.
<b>Rehabilitation and Land Management</b>	To ensure stability, reduce long-term impacts and meet closure objectives.	Rehabilitation activities are integrated with the Klipspruit EMPr, including shaping disturbed areas, stabilising berms and channels, and restoring vegetation cover. Underground stability is maintained through adherence to bord-and-pillar design. Long-term groundwater rebound and wetland integrity are monitored to support post-closure land use planning.	Environmentally stable post-mining landscape, reduced sedimentation risks, alignment with closure commitments, and protected ecological functioning in wetland-associated areas.

## 7.3 Performance Objectives / Goals

The performance related objectives of this IWWMP are therefore to:

- ✔ Minimise volumes of water that are exposed to contaminating materials and substances;
- ✔ Minimise volumes of clean / raw water imported to the mine;
- ✔ Minimize the water use requirements for process activities;
- ✔ Maximise reuse of process water, water removed from underground and treated water;
- ✔ Prevent the deterioration of water quality and quantity in surface water resources;
- ✔ Prevent the deterioration of water quality and quantity in groundwater resources; and
- ✔ Prevent the deterioration of aquatic ecosystem health.

## 7.4 Measures to Achieve and Sustain Performance Objectives

The Unwabu underground expansion will be managed within the existing Klipspruit water management system. To ensure that environmental performance targets are achieved and maintained, a suite of operational, monitoring and management measures are required. These measures focus on the integrated management of mine water, salt loads, stormwater, effluent handling and long-term rehabilitation commitments. Each measure is designed to support legal compliance, reduce hydrochemical risks, and maintain system stability throughout the life of mine.

### 7.4.1 7.4.1 Water and Salt Balance

Effective management of water volumes and dissolved salt loads is essential for both operational efficiency and environmental protection. The following measures will be implemented:

- ✔ Maintain an updated site-wide water balance that incorporates underground inflows from Pits BD and H, pumped volumes to PCD4, process water reuse, and evaporation losses. The balance will be recalculated routinely and whenever material changes in inflow occur.
- ✔ Integrate underground dewatering inflows into the central KPS water management circuit to prevent uncontrolled releases and ensure that all mine water is directed to authorised storage facilities.
- ✔ Monitor Total Dissolved Solids (TDS), sulphates and major ions at key points in the circuit (PCDs, pumping stations and boreholes) to track salt accumulation and detect deviations early.
- ✔ Optimise internal water reuse, including the recirculation of mine water for coal processing, dust suppression (if authorised), and underground operational needs to minimise freshwater abstraction.

- Track salt loads entering and leaving the system, including salt cycling through PCDs, and maintain operational thresholds aligned with WUL limits.
- Maintain freeboard and design capacities in PCD4 and associated infrastructure to ensure safe containment of inflow volumes, particularly during high rainfall periods.

Together, these measures ensure that water and salt fluxes remain within controllable limits, reducing the likelihood of uncontrolled discharges or water quality deterioration.

#### 7.4.2 Storm Water (Clean and Dirty)

Although the Unwabu project introduces no new surface infrastructure, stormwater management remains a critical component of the site-wide water system. Measures include:

- Maintain strict clean/dirty water separation using the existing GN704-compliant stormwater control system—berms, channels, and perimeter drains—to prevent stormwater contamination from operational areas.
- Ensure that no stormwater enters underground workings by maintaining sealed entries, appropriate grading around portals, and functioning diversion berms upstream of all access points.
- Inspect and maintain stormwater controls prior to and during rainy seasons to verify the integrity of berms, drains, culverts, and clean-water diversion structures.
- Contain dirty stormwater associated with coal handling and operational areas within the dirty-water reticulation system leading to PCD4 and associated infrastructure.
- Implement regular housekeeping practices, including clearing debris from channels, ensuring no blockages occur, and maintaining functional flow paths.
- Maintain compliance with GN704 Regulations 4, 7 and 10, ensuring that stormwater is prevented from interacting with coal residues, hydrocarbons or contaminated areas.

These measures ensure that the mine remains resilient during storm events and that clean-water resources remain protected from contamination.

#### 7.4.3 Effluent Management

The underground project generates limited effluent beyond mine water inflows; however, appropriate measures must be maintained to ensure compliance:

- Route all underground ingress water to authorised containment (PCD4) through the existing pumping and rising main system, ensuring no uncontrolled release to surface watercourses.
- Prevent effluent discharge to the environment by operating fully within the zero-effluent water management philosophy adopted by Klipspruit.

- ✔ Maintain and calibrate flow meters (e.g., CL241-FQI001 and FQI003) to ensure accurate measurement of pumped water volumes, consistent with Section 21(j) requirements.
- ✔ Ensure any hydrocarbon-contaminated water from workshops, pump stations or service areas is processed through oily water separators before entering the dirty-water circuit.
- ✔ Manage sewage and greywater from surface facilities via existing treatment and conservancy systems, ensuring regular removal by licensed service providers.
- ✔ Enforce strict spill prevention and response protocols, ensuring rapid containment and remediation of any accidental releases.
- ✔ Conduct routine monitoring of effluent quality parameters (pH, EC, TDS, sulphates, metals) as per the WUL schedule to confirm compliance and detect trends.

These measures ensure that effluent is managed in a controlled, compliant and environmentally responsible manner.

#### 7.4.4 Rehabilitation

Although the Unwabu project does not introduce new surface disturbances, rehabilitation measures remain essential to ensure long-term stability and compliance with closure objectives:

- ✔ Maintain underground structural stability through adherence to the approved bord-and-pillar design, ensuring adequate pillar support to avoid surface subsidence above BD and H workings.
- ✔ Rehabilitate surface infrastructure areas (when decommissioned) in accordance with the mine's approved EMP, including shaping, ripping, topsoiling and revegetation where required.
- ✔ Monitor wetlands and drainage systems above or adjacent to underground workings to verify that no adverse impacts (such as drawdown-induced desiccation) occur over time.
- ✔ Implement groundwater monitoring during operational and post-operational phases to ensure early detection of changes linked to underground mining.
- ✔ Progressively rehabilitate non-operational areas within the broader KPS footprint to reduce long-term impacts and demonstrate alignment with closure commitments.
- ✔ Update rehabilitation plans and closure costs annually as part of the Financial Provisioning regulations, ensuring alignment with the life-of-mine and underground schedule.

These measures ensure that the underground project remains environmentally stable during operations and contributes to the mine's long-term rehabilitation and closure obligations.

**Table 7-2: Measures to Achieve and Sustain Performance Objectives**

Management Area	Performance Objective	Measures to Achieve and Sustain Performance
<b>Water &amp; Salt Balance</b>	Maintain a stable and compliant site-wide water and salt balance	<ul style="list-style-type: none"> <li>• Maintain an updated mine-wide water balance incorporating BD/H underground inflows.</li> <li>• Integrate all pumped water into the authorised KPS dirty-water circuit (PCD4).</li> <li>• Monitor TDS, sulphates and major ions at PCDs, boreholes and pumping stations.</li> <li>• Optimise internal reuse of mine water to reduce freshwater demand.</li> <li>• Track salt loads entering and circulating within the water system.</li> <li>• Maintain PCD freeboard and verify design capacity before wet seasons.</li> <li>• Implement corrective action when water balances exceed operational thresholds.</li> </ul>
<b>Stormwater (Clean &amp; Dirty Water)</b>	Prevent contamination of clean water and ensure compliant management of dirty water	<ul style="list-style-type: none"> <li>• Maintain strict clean/dirty water separation using GN704-compliant drains, berms and channels.</li> <li>• Prevent stormwater ingress into underground workings by maintaining diversion berms and sealing portals.</li> <li>• Conduct routine inspections of stormwater infrastructure, especially before rainfall periods.</li> <li>• Direct all dirty stormwater to PCD4 and associated dirty-water systems.</li> <li>• Maintain stormwater structures free of sediment, debris and blockages.</li> <li>• Ensure compliance with GN704 Regulations 4, 7 and 10.</li> </ul>
<b>Effluent Management</b>	Ensure safe, compliant and controlled management of all operational effluent	<ul style="list-style-type: none"> <li>• Route all underground ingress water to PCD4 via existing pumping infrastructure.</li> <li>• Maintain a zero-effluent discharge approach—no uncontrolled release to the environment.</li> <li>• Calibrate and maintain flow meters (e.g., CL241-FQI001/FQI003) to ensure accurate measurement.</li> <li>• Treat hydrocarbon-contaminated water via oily water separators before entering the dirty-water circuit.</li> <li>• Manage sewage and greywater through existing treatment and conservancy systems.</li> <li>• Enforce spill prevention and rapid-response procedures.</li> </ul>

Management Area	Performance Objective	Measures to Achieve and Sustain Performance
		<ul style="list-style-type: none"> <li>• Conduct routine effluent quality monitoring (pH, EC, TDS, sulphates, metals) as per WUL conditions.</li> </ul>
<b>Rehabilitation</b>	Ensure long-term environmental stability and alignment with closure objectives	<ul style="list-style-type: none"> <li>• Maintain underground stability through approved bord-and-pillar design to minimise subsidence.</li> <li>• Rehabilitate decommissioned surface infrastructure according to EMPr requirements.</li> <li>• Monitor sensitive wetlands and drainage systems above underground workings for drawdown impacts.</li> <li>• Continue groundwater monitoring during operations and post-closure to detect changes.</li> <li>• Progressively rehabilitate inactive areas within the broader KPS footprint.</li> <li>• Update rehabilitation and closure costs annually per Financial Provision Regulations.</li> <li>• Align rehabilitation objectives with long-term closure outcomes for Klipspruit.</li> </ul>

## 7.5 Option Analyses and Motivation for Implementation of Preferred Options (Optional)

Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives aid in identifying the most appropriate method of developing the Project, considering location or site alternatives, activity alternatives, processing or technology alternatives, as well as the no-project alternative. Alternatives also aid in determining the activity with the least environmental impact.

According to the South African Chamber of Mines, coal mining in South Africa produces enough coal to account for 94% of its energy production, highlighting how essential this industry is for infrastructure development. South Africa is one of the world's top 5 Coal exporters. The coal mining industry directly employs close to 90,000 people and paid almost R 19-billion in wages in 2014. Including massive electricity generation, coal is also utilised significantly as a liquid fuel to power millions of lower-income households. Coal mining in South Africa provides jobs and energy while contributing to our country's GDP.

### 7.5.1 Mining Methods

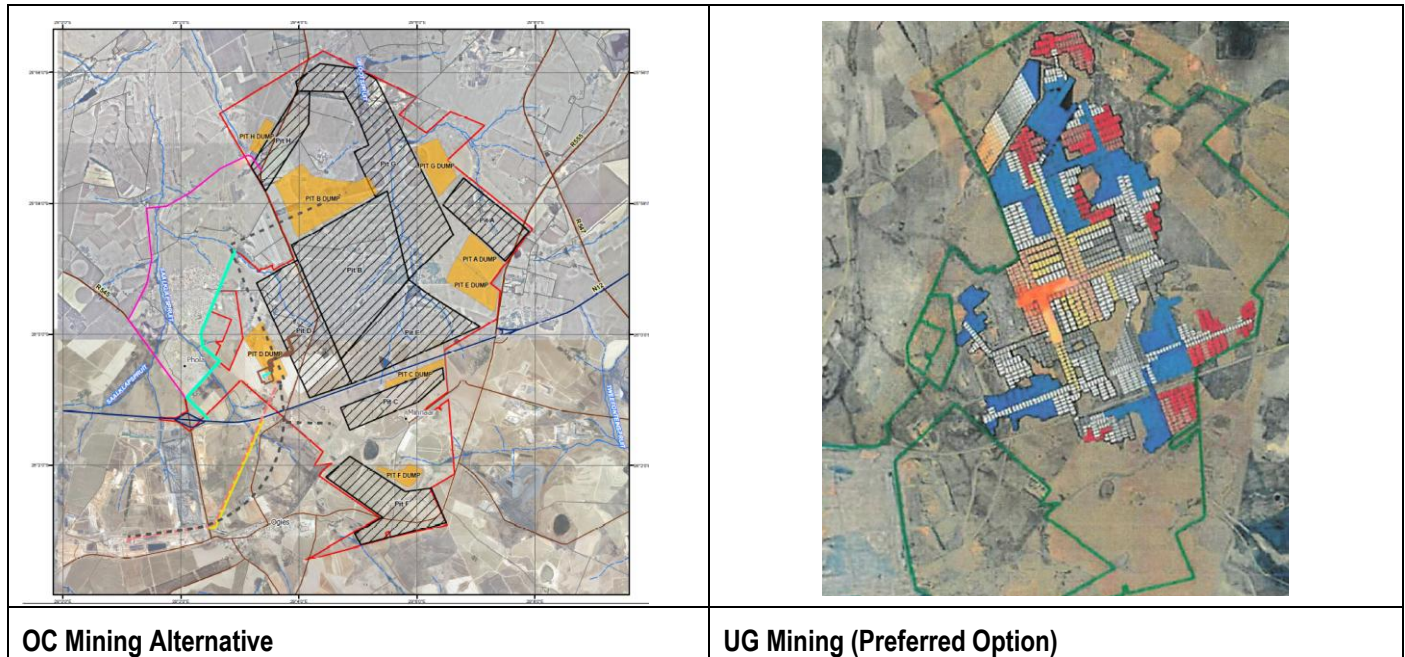
An array of underground and surface mining techniques exists; however, technical and economic feasibility studies are required to determine which process/method is best. These studies are based on the regional geologic conditions, including characteristics of the site; seam continuity; thickness; structure; quality; and depth and strength.

Both the OC mining method and the UG method were considered, where the UG mining was found to be the preferred mining strategy going forward due to the following reasons:

- The proposed area of mining has a significant number of wetlands which will be destroyed when using OC method;

- ☛ The destruction of wetlands requires rehabilitation compensation measures in other wetlands within the catchment which require significant financial resources;
- ☛ Most of the areas to be mined at KPSX had significantly higher strip ratios which would increase the mining expenses and waste management costs.

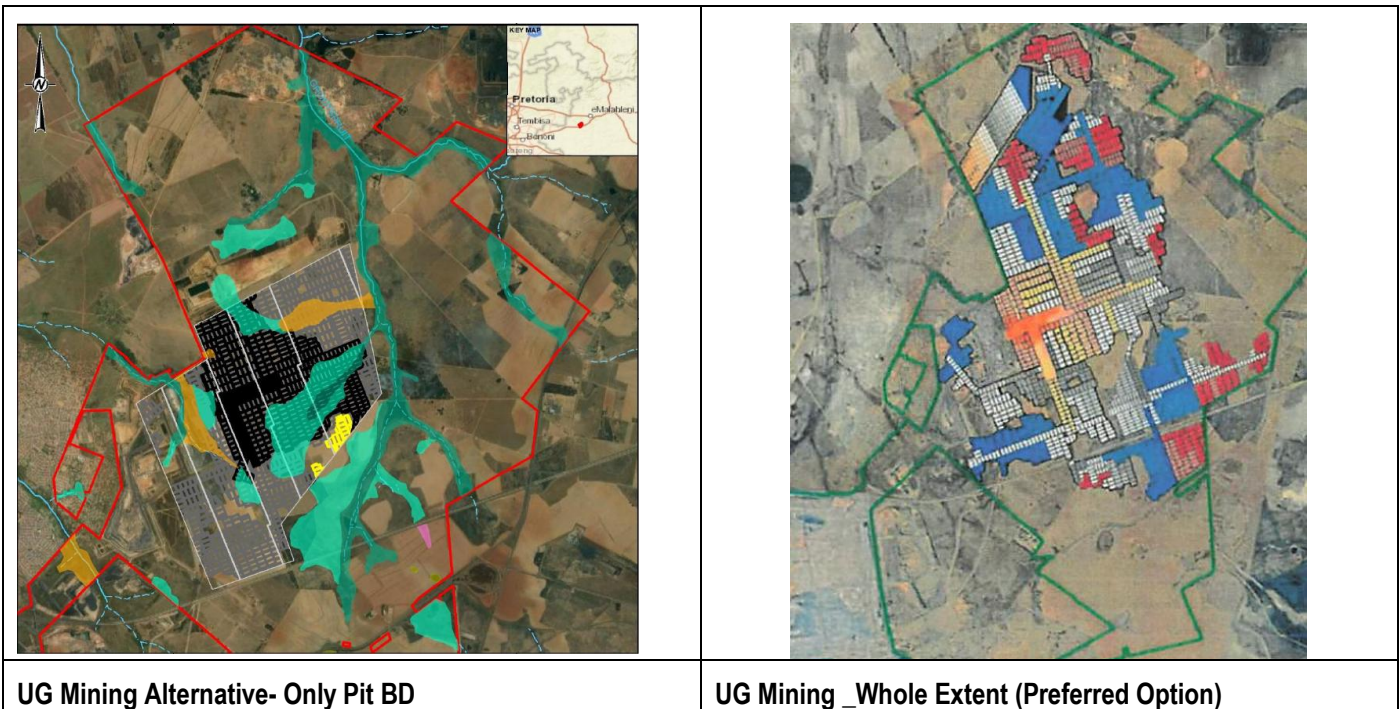
The OC mining considered and the UG preferred option are illustrated in Figure 7-1 below.



**Figure 7-1: Mining Method Alternatives**

### 7.5.2 Land Use Alternatives

As Pit BD mining has already been approved in 2017 for OC mining, KPS did consider only converting this pit to UG mining initially, as it was assumed that the authorisation process for the amendment would be quicker. However, the economic viability of the project was not adequate to sustain the project, hence the preferred alternative was to mine the economically viable reserves remaining at KPSX. The considered alternatives are illustrated in Figure 7-2 below.




**Figure 7-2: Mining Footprint Alternatives**

### 7.5.3 Infrastructure Alternatives

The table below provides a summary of the current infrastructure at KPS and the additional infrastructure which forms part of this application.

**Table 7-3: Summary of the Approved and Proposed Infrastructure Amendments/Additions for Project**





Approved Infrastructure Requirements	Proposed Amended Infrastructure Requirements
<ul style="list-style-type: none"> <li>✔ Open-pit BD including ramps and box cuts;</li> <li>✔ Internal haul roads; and haul roads for the transport of ROM coal to KPS;</li> <li>✔ Access roads for light vehicles;</li> <li>✔ Clean water cut off canals and stormwater berms;</li> <li>✔ Raw water tanks;</li> <li>✔ ROM stockpile and tip area;</li> <li>✔ Overland conveyor;</li> <li>✔ Overburden and topsoil stockpiles;</li> <li>✔ Substation;</li> <li>✔ PCDs and associated pipelines to the PCPP;</li> <li>✔ Diesel and oil storage tanks;</li> <li>✔ Fuel bay</li> <li>✔ Change house facilities;</li> <li>✔ Sewage treatment plant (STP);</li> <li>✔ Workshops and mobile offices;</li> <li>✔ High mast communication tower;</li> </ul>	<ul style="list-style-type: none"> <li>✔ Change in mining method of Pit H from Oc to UG;</li> <li>✔ Pit BD UG mining expansion</li> <li>✔ Stormwater management infrastructure.</li> </ul>

Approved Infrastructure Requirements	Proposed Amended Infrastructure Requirements
 Electricity supply to workshops and shovel.	

#### 7.5.4 No-Go Option

The No-Go option considers the implications of not proceeding with the Unwabu underground expansion (Pits BD and H) and maintaining the status quo at Klipspruit. Under this scenario, the underground reserves associated with BD and H would remain unmined, and no additional dewatering, underground development, or operational activities would occur in these areas.

From a water resource perspective, the No-Go option would avoid the incremental groundwater inflows associated with underground development and would therefore eliminate the need for authorisation of the newly triggered Section 21(j), 21(c) and 21(i) water uses. Surface and subsurface hydrological conditions would remain largely unchanged, with no alteration of groundwater gradients, no additional interaction with wetland influence zones, and no need for expanded monitoring or modelling. However, the No-Go option also presents several strategic, environmental and socio-economic drawbacks that must be acknowledged. The BD and H reserves form part of the planned life-of-mine sequence for Klipspruit, and their exclusion would:

-  reduce the available underground coal resource, shortening the operational life of the mine;
-  result in the underutilisation of existing authorised underground infrastructure, which has already been established to support deeper and lateral expansions;
-  increase pressure on other mining areas to sustain production, potentially shifting environmental impacts rather than avoiding them; and
-  delay or alter rehabilitation sequencing that depends on predictable mining progression.

From a water management perspective, the No-Go option does not necessarily yield a long-term benefit. Klipspruit's existing water system is designed for fully integrated management of underground inflows, dirty water, and reuse opportunities. Preventing underground mining in BD and H would reduce the efficiency of water reuse within the system and may increase reliance on external water sources to meet operational requirements. In addition, the No-Go option may have broader socio-economic effects. Reduced mining progression affects employment, local procurement, and community economic activity associated with the mine. Although these considerations extend beyond the strict environmental focus of the IWWMP, they form part of the holistic evaluation required under integrated water resource management principles.

Overall, while the No-Go option avoids the incremental underground water uses associated with Project Unwabu, it does not provide a more sustainable or balanced outcome when environmental, operational and socio-economic factors are considered together. The managed implementation of the underground expansion, supported by appropriate water and waste management measures, presents a more favourable option compared to halting the project altogether. The ongoing capital investment planned for KPS for the development of UG and OC mining is estimated at R1.7 billion and will not be invested if the project does not continue.

## 7.6 IWWMP Action Plan

The Action Plan forms the operational core of this IWWMP and translates the strategic water, waste, groundwater and stormwater management commitments into clear, measurable, and auditable actions for the Klipspruit Colliery's Unwabu underground expansion (Pits BD and H). Its purpose is to ensure that all authorised water uses, supporting infrastructure, monitoring programmes, and compliance obligations are implemented consistently throughout the life of mine, in accordance with the NWA, GN R267, GN 704, the Environmental Authorisation, the EMPr, and the current SWMP.

Because the Unwabu project relies solely on existing Klipspruit surface infrastructure and introduces no new disturbed footprint, the emphasis of the Action Plan is on strengthening operational controls, ensuring ongoing compliance with Section 21 water uses, and maintaining the integrity of stormwater, groundwater and process-water systems as underground mining progresses. The Action Plan therefore provides a comprehensive set of responsibilities and performance indicators for all elements of the mine's water management system, including underground dewatering, PCDs, stormwater separation, groundwater protection, wetland monitoring, effluent and waste management, incident response, rehabilitation, infrastructure maintenance, and regulatory reporting.

The actions in this section are designed to be specific, measurable, time-bound, and traceable, enabling transparent internal oversight and regulatory auditing by the DWS. Each action includes:

- 🌱 the operational area to which it relates,
- 🌱 the required activity or control measure,
- 🌱 the responsible department or individual,
- 🌱 the timing or frequency of implementation, and
- 🌱 clear performance indicators for assessing effectiveness and compliance.

This approach ensures that the IWWMP remains a living, adaptive management tool, capable of responding to hydrological changes, mining progress, regulatory amendments, and findings from monitoring programmes or audits. The Action Plan is reviewed annually, or sooner if material operational or environmental changes occur, to ensure it always reflects current risks and operational realities at Pits BD and H.

The table below sets out the full Action Plan required for implementation of the IWWMP.

The operational action plan will be developed once the WUL has been issued so as to align with the conditions of the WUL with the plan.

**Table 7-4: IWWMP Action Plan**

Action Area	Required Action	Responsible Party	Frequency / Timing	Performance Indicator
<b>Underground Dewatering (Section 21(j))</b>	Operate and maintain BD/H underground pumping system to ensure all ingress water is routed to PCD4.	Mine Engineering & Water Management Team	Continuous	No uncontrolled release; Pump uptime >95%; Accurate flow records.
	Calibrate and verify flow meters (CL241-FQI001 & FQI003); maintain daily abstraction logs.	Water Management Team	Monthly calibration; Daily logging	Calibration certificates; Daily logs filed in WUL compliance file.
<b>Water &amp; Salt Balance</b>	Update site-wide water balance incorporating BD/H inflows, PCD volumes, reuse trends and groundwater ingress.	Environmental Dept. & Water Specialist	Quarterly, and after major hydrological events	Updated water balance model; <10% variance between predicted and actual volumes.
	Track salt loads (TDS, sulphates) in PCDs and at monitoring points.	Environmental Dept.	Monthly	Salt load trends stable and within WUL conditions.
<b>PCD &amp; Water Infrastructure Management</b>	Maintain PCD4—and other PCDs serving BD/H—with adequate freeboard as per GN704 and WUL.	Mine Water Management Team	Weekly inspections	Required freeboard maintained; No overtopping.
	Inspect pipelines, valves, pumps, stormwater channels and infrastructure linked to the dirty-water system.	Engineering Team	Weekly and after heavy rainfall	Inspection sheets completed; All maintenance close-out actions recorded.
<b>Stormwater Management</b>	Maintain clean/dirty water separation through berms, drains, and diversion channels around BD/H.	Environmental & Engineering Teams	Monthly and pre-rainy season	No clean/dirty water mixing; Berms, channels and drains intact.
	Prevent stormwater ingress into underground workings via grading, portal sealing and maintaining surface integrity.	Engineering & Mine Ops	Quarterly	No stormwater in underground sump logs.
<b>Effluent &amp; Pollution Prevention</b>	Operate oily-water separators; direct all contaminated water to dirty-water system.	Engineering & Workshop Supervisors	Weekly	OWS functioning effectively; No hydrocarbon traces in clean-water system.

Action Area	Required Action	Responsible Party	Frequency / Timing	Performance Indicator
	Implement spill response SOPs; ensure spill kits available; train personnel.	All Staff under Environmental Dept.	Ongoing; Spill drills twice per year	Spill register maintained; All spills closed out and remediated.
<b>Groundwater Monitoring</b>	Monitor groundwater quality and levels at upgradient/downgradient boreholes and wetland influence zone wells.	Environmental Dept. & Hydrogeologist	Quarterly (or WUL-specified)	Complete dataset; No missed samples; Trends analysed annually.
	Trigger investigative monitoring if deterioration or upward contaminant trends occur.	Environmental Dept.	As triggered	Additional monitoring completed; Reports submitted.
<b>Surface Water &amp; Wetland Monitoring</b>	Monitor wetland flows, water levels and water quality in systems intersected by the BD/H subsurface footprint.	Environmental Dept. & Wetland Specialist	Quarterly	No significant deviation from baseline PES/EIS triggers.
	Monitor signs of wetland desiccation or hydrological alteration above underground workings.	Environmental Dept.	Quarterly	Wetland hydrology maintained; No reduction in saturation trends.
<b>Compliance With Authorisations</b>	Review WUL, EA and IWWMP conditions and cross-check compliance quarterly.	Environmental Dept.	Quarterly	Compliance register updated and corrective actions implemented.
	Submit annual WUL monitoring reports, groundwater trend analyses, and water balance reports.	Environmental Dept.	Annually	All reports submitted on time; Acknowledged by DWS.
<b>Incident Management</b>	Report water-related incidents to DWS within 24 hours; submit corrective action plan within 14 days.	Environmental Dept.	As required	Incident reporting timelines met; Corrective action implemented.
<b>Rehabilitation &amp; Closure Planning</b>	Update annual rehabilitation and closure cost assessments as per Financial Provision Regulations.	Environmental Dept. & Mine Planning	Annually	Updated rehabilitation liability and schedule approved annually.
	Monitor subsidence potential and structural stability of bord-and-pillar workings.	Geotechnical & Mining Engineers	Annually	No unacceptable subsidence; Monitoring records complete.
<b>Waste Management</b>	Manage hazardous waste (hydrocarbons, contaminated materials) per NEM:WA; maintain manifests.	Environmental Dept. & Waste Contractors	Ongoing	Valid disposal certificates; Waste removed timeously.

Action Area	Required Action	Responsible Party	Frequency / Timing	Performance Indicator
<b>Housekeeping &amp; Infrastructure Integrity</b>	Keep all drains, channels, pump stations, sumps and pipelines free of sediment, debris, and blockages.	Engineering & Ops	Weekly	Clean inspection reports; No blockages observed.
<b>Monitoring Network Integrity</b>	Maintain boreholes, surface water points, PCD sampling points and flow meters in operable condition.	Environmental Dept. & Engineering	Monthly	100% of monitoring points functional; No data gaps.
<b>Reporting &amp; Recordkeeping</b>	Maintain complete IWWMP file with monitoring data, water balances, incident reports, audits and compliance records.	Environmental Dept.	Continuous	All records retrievable within 24 hours; File up to date.
	Conduct internal environmental audits aligned with EA and WUL requirements.	Environmental Dept.	Annually	Audit completed; Findings closed out.
<b>Stakeholder &amp; Regulatory Engagement</b>	Notify DWS of operational changes affecting water uses or water management infrastructure.	Environmental Dept.	As required	Notification logs maintained; DWS acknowledgement received.
<b>Review &amp; Update of IWWMP</b>	Update the IWWMP annually or when operational, hydrological or regulatory changes occur.	Environmental Dept. & Specialists	Annually	Updated IWWMP issued; Revision register maintained.

## 7.7 Control and Monitoring

Effective control and monitoring are essential to ensure that the Unwabu underground expansion remains compliant with regulatory requirements, performs within authorised limits, and continues to meet the environmental objectives established in this IWWMP. Monitoring provides the evidence base for adaptive management, allowing the mine to detect trends, evaluate performance, and respond proactively to deviations from expected behaviour. The control and monitoring programme described below integrates groundwater, surface water, wetlands, aquatic health, operational performance measures and the functionality of the IWWMP Action Plan.

### 7.7.1 Monitoring of Change in Baseline (environment) Information (surface water, groundwater and bio-monitoring)

Baseline environmental conditions for groundwater, surface water, wetlands and aquatic ecology have been thoroughly documented through previous WULAs, Environmental Authorisations, specialist studies and site baseline assessments undertaken for Klipspruit. These datasets provide the reference condition against which all future monitoring results will be evaluated.

The monitoring programme implemented for the Unwabu underground expansion will continue to build on the established Klipspruit monitoring network and will be refined or expanded as required by operational changes, new regulatory requirements or emerging environmental risks. Key monitoring components include:

#### 7.7.1.1 Surface Water Monitoring

Surface water quality and levels will be monitored at all established upstream and downstream sampling sites to detect any changes linked to underground dewatering, dirty-water management or stormwater systems. Monitoring will track indicators such as pH, EC, TDS, sulphates, metals and nutrients.

#### 7.7.1.2 Groundwater Monitoring

The groundwater monitoring network will continue to measure water levels and quality at strategically positioned shallow and deep boreholes, including those within and adjacent to wetland influence zones. Data will be used to detect drawdown patterns, groundwater chemistry changes, and any emerging risks associated with the underground workings.

#### 7.7.1.3 Wetland and Aquatic Bio-Monitoring

Bio-monitoring of wetlands and aquatic ecosystems will be conducted in accordance with the requirements of the Environmental Authorisation and WUL. The purpose is to assess ecological condition, detect hydrological or geochemical stress, and confirm that subsurface mining does not compromise wetland function or aquatic biodiversity.

All monitoring datasets will be routinely compared to baseline conditions to assess whether the project remains within expected impact thresholds. Any significant deviations will trigger additional investigations, adaptive management actions and, where necessary, regulatory notifications.

## 7.7.2 Audit and Report on Performance Measures

Performance measures identified in this IWWMP, including water balance stability, stormwater control integrity, groundwater responses, effluent quality and infrastructure functionality, will be subject to regular internal and external audits. These audits will:

- ✔ verify the accuracy and completeness of monitoring data,
- ✔ assess compliance with WUL conditions, GN704, EMPr requirements and Section 28 duty-of-care obligations,
- ✔ evaluate the operability and effectiveness of dewatering systems, stormwater controls and contaminated-water management structures,
- ✔ measure the mine's performance against numerical and qualitative indicators defined in Chapter 7.4, and
- ✔ identify areas requiring corrective or preventive action.

Audit findings will be documented in formal audit reports, which will be submitted in accordance with regulatory reporting timeframes and maintained within the site's environmental management system. Any non-compliance, emerging risk or system inefficiency identified through auditing will be addressed immediately through the Action Plan and relevant operational procedures.

## 7.7.3 Audit and Report on Relevance of IWWMP Action Plan

The IWWMP Action Plan forms the operational backbone of water and waste management at Klipspruit. To ensure its continued relevance and effectiveness, the Action Plan will be reviewed and audited at least annually, and whenever material operational changes occur. The audit will assess:

- ✔ whether the actions remain appropriate for the current stage of underground mining,
- ✔ whether the monitoring programme provides sufficient coverage and resolution,
- ✔ whether the responsible departments are meeting implementation timelines,
- ✔ whether performance indicators remain fit for purpose, and
- ✔ whether new risks or regulatory requirements necessitate amendments to the Action Plan.

Recommendations arising from this audit will be incorporated into revisions of the IWWMP, ensuring that the plan remains a dynamic, adaptive management tool aligned with best practice, regulatory expectations and the evolving hydrological context of the BD and H underground workings.

An annual audit will be compiled by a suitably qualified, external party on the conditions of the IWUL and should also include an audit of activities against GN704. The conditions proposed by DHSWS within the IWUL and the requirements of GN704 will be critical to attaining performance objectives. The IWUL and GN704 audit will compare activities on site and determine the status of thereof. These should be identified as compliant or non-compliant, and recommendations made to rectify any non-compliance identified. Further, the IWWMP and associated monitoring programmes should be reviewed annually and updated where relevant.

Other Performance Assessments include:

- 🌿 All information as required by the various Government Departments should be captured and be readily available for submission when required. Therefore, all monitoring data, inspections, incidences and remedial actions taken must be recorded and logged and be at the disposal of authorities during site visits.
- 🌿 A monitoring/inspection and action log will be maintained on site which will record date of inspection, any evidence of non-compliance observed with regard to the EMP and IWUL, all issues observed during inspections or through monitoring data, and all remediation actions taken. This log will be part of the public domain and be available to authorities during site visits.
- 🌿 A complaints register will be maintained on site and operated in much the same as the incident log as discussed above.
- 🌿 An annual performance assessment (different timeframe may be stipulated by authorities which will then be relevant) will be conducted by an external consultant throughout the life of mine as required by the NEMA. This is conducted to assess the adequacy and compliance of the EMP, and the relevant legislation.

## 8 Conclusion

The Unwabu underground expansion at Klipspruit represents a continuation of authorised mining activities within an established, well-regulated mining complex. The Project relies exclusively on existing surface and underground infrastructure and does not introduce new land disturbance or additional environmental footprint. Its principal water-related implications arise from the dewatering of the BD and H underground workings and the subsurface intersection of hydrological influence zones associated with wetlands and drainage features. These interactions trigger specific water uses under Section 21(c), 21(i) and 21(j) of the NWA, necessitating the current Water Use Licence amendment process.

This IWWMP provides a comprehensive assessment of the baseline hydrological and hydrogeological environment, evaluates the nature and extent of potential impacts associated with the underground expansion, and sets out a detailed suite of management, monitoring and mitigation measures. The analysis demonstrates that the project can be undertaken in a manner that is compliant with statutory requirements, environmentally responsible, and aligned with best practice for underground coal mining in South Africa.

The project introduces no additional risk to surface watercourses, wetlands or surrounding land uses beyond the predictable hydrogeological responses typically associated with underground bord-and-pillar mining. Groundwater inflows can be effectively managed through the existing dewatering network and PCD4 dirty-water reticulation system, and no uncontrolled discharge is anticipated. Stormwater separation systems already in place at Klipspruit remain adequate, and the zero-effluent discharge philosophy continues to apply.

The IWWMP confirms that the proposed underground activities will operate within the established environmental and regulatory framework, including the Klipspruit Mining Right, the Environmental Authorisation, the EMP, GN704 requirements (subject to the limited subsurface exemption), NEMA duty-of-care obligations and waste management regulations. The project's monitoring programme, covering groundwater, wetlands, surface water, quality parameters, salt loads and infrastructure performance, provides sufficient resolution to detect and address any deviation from expected conditions.

Overall, the findings of this IWWMP support the conclusion that the Unwabu BD and H underground expansion can proceed without compromising the integrity of water resources, environmental systems, or the health and safety of surrounding communities. With the implementation of the action plan, monitoring framework, and mitigation measures outlined herein, the project will meet its legal obligations, uphold responsible water stewardship, and contribute to the sustainable continuation of mining activities at Klipspruit.

## 8.1 Regulatory Status of Activity

The Unwabu underground expansion (Pits BD and H) at the Klipspruit operation is an activity regulated under the integrated legislative framework governing mining, environmental management and water use in South Africa. The project does not introduce new surface disturbance and utilises existing authorised infrastructure; however, it requires confirmation of compliance under the MPRDA, NEMA, and the National Water Act (NWA).

The sections below outline the regulatory status of the project under each applicable statute and describe the relationship between the project activities and the authorisations already in place.

### 8.1.1 The Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)

The Klipspruit Mining Right, issued in terms of the MPRDA, authorises Seriti Power to conduct mining operations across a defined set of properties that include Tweefontein 328 JS, Hartebeestlaagte 325 JS, and other farms that underpin the BD and H underground expansion.

The Unwabu project forms part of the authorised mining right footprint, and the change in mining method from open-cast to underground was approved through a Section 102 amendment, as confirmed in the Environmental Authorisation. The MPRDA requires compliance with the approved Environmental Management Programme (EMPr), which includes commitments related to water protection, rehabilitation, underground stability, subsidence prevention and closure planning.

Accordingly, the underground expansion of Pits BD and H is fully aligned with the approved mining right and does not constitute a new or unauthorised mining activity. This IWWMP is prepared to satisfy the water-related obligations arising from the operational expansion under the MPRDA framework, including annual rehabilitation cost updates, monitoring of environmental performance and adherence to EMPr commitments.

### 8.1.2 National Environmental Management Act (NEMA) and National Environmental Management: Waste Act (NEM:WA)

The Unwabu underground expansion is regulated under NEMA through the Environmental Authorisation (EA) issued by the Department of Mineral Resources and Energy (DMRE) for the change in mining method. The EA sets out conditions governing environmental protection, groundwater and surface water monitoring, wetland management, waste handling, emergency response and reporting obligations.

The project introduces no new listed activities under the current EIA Regulations (GN R982–985). All surface infrastructure required for the underground workings already exists within the Klipspruit operation. As such, the EA provides the overarching environmental approval under which this IWWMP must operate.

Under the National Environmental Management: Waste Act (Act 59 of 2008), the project must ensure correct handling, temporary storage and disposal of all hazardous and non-hazardous waste generated by underground operations. No new residue stockpiles or residue deposits are created by the BD/H expansion. Waste streams such as hydrocarbon-contaminated material, used oils, filters and chemical containers must be managed in accordance with NEM:WA and the Waste Classification and Management Regulations.

The regulatory alignment of the BD/H project under NEMA and NEM:WA confirms that all environmental aspects related to underground mining, waste generation, pollution prevention, and duty-of-care compliance are already authorised and governed by the existing EA and EMPr.

### **8.1.3 Statement on Water Uses Requiring Authorisation, Dispensing with Licensing Requirements and Possible Exemption from Regulations**

The National Water Act (Act 36 of 1998) regulates all water uses associated with mining operations. The underground expansion triggers three specific water uses that require authorisation:

- 🌿 Section 21(j): Removal and discharge of water found underground to enable mining.
- 🌿 Section 21(c): Impeding or diverting the flow of water in a watercourse.
- 🌿 Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

For Project Unwabu, these water uses arise exclusively from subsurface interactions, where underground workings extend beneath the hydrological influence zones of wetlands and drainage features. No surface disturbance occurs within regulated areas, and no new stream diversions, dams, roads or infrastructure are proposed.

The project does not qualify for dispensation under the General Authorisation (GN 509) because mining intersects the regulated area of a watercourse, even though the interaction is entirely underground. Therefore, a Water Use Licence (WUL) amendment is required to authorise these water uses.

With regard to possible exemptions, certain restrictions under GN R704—particularly those relating to activities within 100 m of watercourses and within the 1:100-year floodline—were written primarily for surface mining, residue management and infrastructure placement. Since Unwabu involves only underground mining beneath watercourses, and no prohibited surface activity occurs, an exemption is sought only insofar as the underground workings occur beneath regulated zones defined under GN704.

The WUL amendment serves as the formal mechanism to motivate:

- 🌿 authorisation of Section 21(j), (c) and (i) water uses;
- 🌿 recognition that no new licence-exempt water uses apply; and
- 🌿 approval of the limited GN704 exemption applicable solely to subsurface mining beneath watercourses.

All other water management activities at Klipspruit remain fully compliant with the existing WUL, EMPr and GN704 requirements.

The Section 21 water uses included in the WUL requiring authorisation proposed infrastructure amendments and additions to the previously approved authorisations at the Klipspruit Colliery (KPS) in terms of Section 21 of the NWA are:

## 8.2 Motivation in Terms of Section 27(1) of the NWA

The transition to underground mining requires efficient water management to prevent operational disruptions and ensure environmental compliance. Water is essential for:

- 🌿 Underground dust suppression;
- 🌿 Managing groundwater ingress and dewatering activities;
- 🌿 Supporting beneficiation processes at the KPS processing plant;
- 🌿 Implementing environmental management measures for pollution control.

The following section is prepared in line with the requirements of the NWA as set out in section 27 for consideration by the DWS in consideration of the IWULA.

### 8.2.1 Existing Lawful Water Use

In terms of Section 32 of the NWA, existing lawful water use is defined as follows:

*“Water use which has taken place at any time during a period of two years immediately before the date of commencement of the Act (1 October 1996 to 30 September 1998) and which was authorised by or under any law which was in force immediately before the date of commencement of this Act, or which has been declared an existing lawful water use in terms of Section 33 of the Act.”*

As this is a new mining area there is no existing lawful water uses associated with it. All water uses identified for this Project are applied for in this IWWMP's associated IWULA. Existing lawful water uses are defined in Part 3, Section 32 of the National Water Act as water uses that have taken place “at any time during a period of two years immediately before the date of commencement” of the National Water Act, 1998. KPS does not have any ELU registrations. KPS does have a number of WUL which have been approved and include:

A number of Water uses have been authorised for KPS for various water uses triggered in terms of the NWA. These can be summarised as follows:

- 🌿 2012: Licence No. 04/B20G/AG/1531 was issued for water uses:
  - Section 21(a); and
  - Section 21(g).
- 🌿 2016: A General Authorisation for the Northern Bypass Road was issued;
- 🌿 2016: Licence No. 03/B11F/ACGIJ/4740 was issued, and later amended on 04 July 2018 for water uses:
  - Section 21(a);

- Section 21(c);
  - Section 21(i);
  - Section 21(g); and
  - Section 21 (j).
- 🌿 2016: Licence No. 24075037, File No. 16/2/7/B100/C186 issued for water uses (supersedes 2006 WUL):
- Section 21 (a);
  - Section 21 (c);
  - Section 21 (g);
  - Section 21 (i); and
  - Section 21 (j).
- 🌿 2018: Licence No. 12/2/B203/32 was issued for the construction of a dam with a safety risk read with GNR 139 of 24 February 2012.
- 🌿 2023: Licence No. 06/B20G/CGIJ/13591 was issued for was issued for the opencast mining of Pits G, and H S

## 8.2.2 The need to redress the results of past racial and gender discrimination

To give effect to Section 100 (2) (a) of the MPRDA, Section 9 of the SA Constitution and harmonise Government's transformation policies, the Broad-Based Socio-Economic Empowerment Charter for Mining was promulgated. The Mining Charter was compiled with the aim of meaningfully transforming the mining and minerals industry through stimulating the inclusion and participation of Black South Africans in the industry.

Klipspruit has a Social and Labour Plan (SLP) which provides the measures which Madini will use to guide their approach to addressing the results of past racial and gender discrimination for Historically Disadvantaged South Africans (HDSA). According to the Mining Charter every employee must be given an opportunity to become literate and numerate. Seriti is therefore committed to assisting in improving the foundations for skills development by increasing literacy rates and participation in Adult Basic Education and Training (ABET). Seriti will through ABET programmes contribute towards addressing the illiteracy of all its employees and communities, especially HDSA.

Klipspruit recognises that it has a responsibility towards the effective management of the talent pool of existing employees. This commitment seeks to optimize the human resources deployed, to increase the number of HDSA management appointees and to increase female employment to reflect the demographics of the country.

Seriti is furthermore fully black owned, therefore, contributing to the broad government development objectives of creating access to the economy and financial beneficiation by Historically Disadvantaged Individuals (HDI).

Klipspruit also has HDI as the majority in senior mine managerial positions, with women dominating these positions. This addresses the requirement to employ more females within the mining and minerals industry.

The mine largely procures from local suppliers who are BBBEE compliant and are black owned, therefore contributing to redress compliance.

Seriti Power prioritizes transformation by ensuring participation from historically disadvantaged individuals (HDIs) through employment, community development, and local business support. The areas surrounding the Project area, within 10 km, consists of the towns of Ogies and Phola. During the construction phase of the proposed infrastructure amendments, temporary employment opportunities may be created and labour will be sourced from the local surrounding communities.

As part of the Social Labour Plan of KPS, the Project subscribes to a Local Economic Development Policy (LEDP) which promotes the mine's ongoing initiatives to align and involve themselves with Local Economic Development (LED) initiatives and the Integrated Development Plans of the NDM and the ELM.

Seriti's KPS LEDP indicates that the mine will continue with their current LED Projects as well establish new LED Projects that will focus on infrastructure development, basic service provision, poverty eradication, skills development and education provision to communities. Complete details of the LEDP are outlined in Section 3 of the Seriti Social and Labour Plan for KPS.

In addition to the SLP, two percent of Seriti is owned by its employees through and Employee Share Ownership Programme (ESOP) while the remaining eight percent is owned by a Broad-Based Black Economic Empowerment consortium led by Pembani Holdings contributing to Seriti's commitment to address past racial and gender discrimination.

### **8.2.3 Efficient and beneficial use of water in the public interest**

South Africa's mining gross domestic product (GDP) has declined over the past years and recent economic results suggested that the mining sector is one of the sectors have the potential to further contribute immensely to the economy. Thus, the authorisation of this license will make part of the cornerstone of the economy, as exploration activities could lead to possible mining activities which will contribute to the economic sector and create jobs. The Department of Mineral Resources (2011) stated that the composition of South Africa's trade with the other countries in the world is characterised by the export of raw materials.

The creation of direct and indirect employment opportunities by the exploration activities which could potentially lead to mining should be considered as an important contribution to the realisation of some of the priorities set out by the National Water Act (36 of 1998).

The drilling of exploration boreholes process requires considerable amounts of materials, equipment, vehicles and machinery to probe the contents of known ore deposits. The equipment, machinery and vehicles will be purchased and/or hired, and therefore the businesses where those items were sourced from, benefitted financially. More indirect employment opportunities were created in the process and wider markets were positively influenced as well.

If any water will be used, it will be done in a sustainable manner to avoid or minimize wastage. Water will be conserved and re-used in any way possible to further promote the minimum wastage of water resources. In addition, the water will be managed, used efficiently and controlled sustainably to ensure that pollution of the water resources is prevented and/or minimised. According to the

National Water Resource Strategy (2013), the main objective of the National Water Policy is “...*managing the quantity, quality and reliability of the nation’s water resources*” to “...*achieve optimum, long-term, environmentally sustainable social and economic benefit for society from their use*” - which this water use license, when granted, will facilitate.

### **8.2.3.1 Socio-economic impact**

#### **8.2.3.2 If the water use/s are authorised**

The mining sector has been described as the “Continuous Sunrise Sector” by President Cyril Ramaphosa at the ‘Investing in African Mining Indaba’ in Cape Town during May 2022, due to the significant contribution which the sector continues to have on the country’s economy. Despite the many challenges created by the Covid-19 Pandemic, the mining sector continued to contribute substantially to export earnings, is a critical source of foreign direct investment and provides employment for a considerable number of people.

As the economic effects of the Covid-19 Pandemic subsided, the mining sector has significantly contributed to the recuperation of South Africa’s economy following the pandemic. In 2021, the mining sector registered a growth of 11.8%, the largest grown seen across all the industries in the economy at the time. The sector was able to recover production close to pre-covid conditions.

In 2019 StatSA provided a report detailing the statistics on mineral production, finances, employment, and exports and imports. The results of the census conducted revealed the importance of the South African Mining Industry. The industry is a critical pillar of our economy, with R527,5 billion in total sales generated in 2019. Of this, 61% (R323,8 billion) was sourced from outside the country through exports. Coal dominates production in South Africa. It covers about 75% of the total mass of all minerals produced in SA. In 2019, 306 million metric tons of coal was produced. Almost two-thirds of mining sales are from abroad, with 39% of coal produced being exported.

The extracting and processing of minerals requires a great deal of machinery and workforce. The South African mining industry employed 514 859 individuals in 2019, with 39% employed in the platinum group metals sector, 21% in the coal sector and 20% employed in the gold sector.

Recent statistics note that mining in South Africa still directly employs over half a million people post-covid. At the 4th South African Investment Conference in 2022, investments of approximately R46 billion was pledged towards mining and mineral beneficiation, showing investor confidence in South Africa’s mining potential and operations.

Mpumalanga has a negative lifetime net immigration of -24 246, with an in-migration of 648 017 and out-migration of 672 263.2 Improved economic activity will help to minimise the movement of family members to other provinces, to decrease the high population pressure in Gauteng, but will increase opportunities for family cohesion.

Mpumalanga remains the main labour sending province to the mine, with 68% of the employees residing within 60km radius and 17% still from Mpumalanga but outside 60km radius. This means that 85% of the employees were from Mpumalanga based on the 2018 details. Continuation of Klipspruit operations is expected to improve the trend.

The mine currently contributes on Projects that contributes towards community social and economic transformation. These include Projects that e.g. contribute to municipal local water supply infrastructure maintenance, Extension of local clinic for improved health

services, construction, improvement and maintenance of access roads to community residential areas. The latter Projects are linked to municipal Integrated Development Plans (IDP) and Local Economic Development (LED) that are developed through community consultation, which the mine is part of.

The average monthly amount paid for water services received from the municipality totals R52 000.00 which is 3 050 KL/M. This is a significant contribution to the municipal revenue annually.

### **8.2.3.3 The failure to authorise the water use/s**

The no-go option would also prevent the socioeconomic benefits, including the need for job security, increased socio-economic activity and social upliftment. If this Project does not continue, the applicant will be prevented from investing a significant amount of money into the communities in the form of salaries, which will have a direct impact on the local community. The presence of the mining activity, the employment of local persons and the utilisation of local services will result in an increased income for local communities and business and an increased tax base for traditional authorities and municipalities. These opportunities will be lost should the Project not proceed, and will have consequences on locally, regionally and nationally.

Failure to authorise the use could result in cutting household incomes and increased poverty levels.

The decline of the required water uses will prevent the prospecting operations to commence, thus having a negative impact on the social and economic environment for the surrounding communities. Such disadvantages will include –

- ☛ There will be a loss of potential employment opportunities amongst previously disadvantaged worker in the surrounding area as the applicant will not be able to employ them;
- ☛ As mentioned above, employment opportunities will be lost. It is important to mention that some of these workers account for the main income in their families which will mean that their families will also suffer under the consequences of the decline of the water use licence in question;
- ☛ All investments that were made and is prospected to be made in terms of the prospecting activity and consequently the water use in question, will be lost and the applicant may experience great financial loss;
- ☛ Growth within the market of mining and other sectors will decline;
- ☛ Diversifying of the economy will be hindered;
- ☛ The opportunity for the DWS to legalise water and thus, having the opportunity to enforce conditions to help develop, manage and conserve water resources, will be no more;
- ☛ Other potential investors might be discouraged to invest in the mining sector;
- ☛ The development potential for local and wider communities will be absent;
- ☛ The effective utilization of water and mineral will not occur.

## 8.2.4 Any catchment management strategy applicable to the water resource

Chapter 2 of the Constitution outlines the Bill of Rights. Each person has the right to natural resources including water. The DWS are the primary custodians of the water resources in the country.

The DWS is responsible for the National Water Resource Strategy (NWRS) for South Africa. The goal of the NWRS describes the methods to protect, use, develop, conserve, manage and control the country's freshwater resources in accordance with the requirements of the legislative frameworks of the country. According to the NWA, a Catchment Management Agency (CMA) should be established for each water management area. The CMA will then be responsible for the Catchment Management Strategy for each water management area.

The sourced water will be used efficiently and sparingly as possible and negative impacts to the water resources will be minimised by implementing monitoring of both surface water and groundwater. The groundwater monitoring data will be supplied to DWS for record keeping and to expand the DWS database. All water related infrastructure will also be constructed in line with BPGs and will be fully compliant with all legislative requirements.

The country has been divided into 9 new Water Management Areas (WMAs). The delegation of water resource management from central government to catchment level will be achieved by establishing Catchment Management Agencies (CMAs) at WMA level. Each CMA will progressively develop a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA (DWA, 2004). Until such time as the CMAs are established and are fully operational, the Regional Offices of DWS will continue managing the water resources in their areas of jurisdiction.

The colliery falls within the Olifants Water Management Area 2, within quaternary catchments B20G. These catchments are part of the greater Wilge River Catchment, which feeds into the Loskop Dam Catchment. The Olifants CMA has been administratively established (Gazette Number 38492, 27 February 2015), but it is not yet fully operational and the delegation of water resource management is still with the central government, which is represented by DWA.

The Classification of significant water resources in the Olifants Water Management Area Project were given in a series of reports by the Department of Water Affairs (DWA, 2011; DWA, 2013). These have been very recently updated and published for comment by the Department of Water and Sanitation (DWS) on 22 September 2017.

The Unwabu Project is located within the Olifants River Catchment, which forms part of the Olifants Water Management Area (WMA). The Olifants Catchment Management Agency (CMA) is responsible for managing water resources in this region, ensuring sustainable water use while balancing the demands of industry, agriculture, and local communities.

- 🌿 The catchment is highly stressed, with competing water demands from:
- 🌿 Mining operations, which require water for coal processing, dust suppression, and other industrial activities.
- 🌿 Agricultural activities, which depend on water for irrigation and livestock farming.
- 🌿 Municipal and domestic users, including local communities and urban settlements.

- Ecological reserves, which must be maintained to protect aquatic ecosystems and biodiversity.

Given these competing demands, it is essential that all water users align with the Olifants Catchment Management Strategy to ensure equitable and sustainable water allocation.

#### **8.2.4.1 Alignment with the Catchment Management Strategy**

The authorization of water use for the Unwabu Project is aligned with the objectives of the Olifants Catchment Management Strategy, which include:

##### **8.2.4.1.1 Sustainable Water Use and Conservation**

- Seriti Power has implemented water-saving measures such as increased water recycling and reuse, reducing reliance on fresh water.
- The Project integrates closed-loop water systems to minimize water losses.

##### **8.2.4.1.2 Protection of Water Resources**

- Water pollution prevention strategies, including sediment control measures, pollution control dams, and water treatment facilities, are incorporated to safeguard downstream users.
- Compliance with wastewater discharge standards ensures minimal contamination of water bodies.

##### **8.2.4.1.3 Equitable Water Allocation**

- The water allocation for the Unwabu Project takes into account the needs of other water users, ensuring that the Project does not compromise the availability of water for surrounding communities, agriculture, and the environment.
- Engagement with the Olifants CMA and other stakeholders ensures that water use remains within agreed limits.

##### **8.2.4.1.4 Climate Resilience and Adaptation**

- Given the impacts of climate change on water availability, Seriti Power has adopted adaptive water management strategies to enhance resilience against droughts and changing rainfall patterns.
- Investments in alternative water supply sources (such as rainwater harvesting and treated mine water use) reduce pressure on freshwater resources.

##### **8.2.4.1.5 Compliance with National Water Regulations**

- The Project adheres to the National Water Act, 1998 (Act No. 36 of 1998) and other relevant regulatory frameworks.
- Regular water quality monitoring ensures compliance with WUL conditions and national water standards.

#### **8.2.4.2 Contribution to Regional Water Resource Management**

The Unwabu Project contributes to the broader catchment management strategy through:

- Collaborative water stewardship initiatives with other industries and stakeholders in the region.

- Active participation in water forums to address water challenges in the catchment area.
- Investment in research and innovation to improve water efficiency in coal mining operations.

The Unwabu Project is aligned with the Olifants Catchment Management Strategy, ensuring that water use is sustainable, equitable, and compliant with regulatory requirements. Through responsible water management practices, Seriti Power is committed to minimizing environmental impacts while supporting the long-term availability of water resources in the region.

### 8.2.5 The likely effect of the water uses to be authorized on the water resource and other water users

Groundwater use in the area is mainly for domestic and stock-watering purposes. Mining operations affect the groundwater resource in two ways:

- Dewatering the surrounding aquifer; and
- Contamination of the surrounding aquifer.

Some of the water in streams is groundwater contribution, flowing into the stream as baseflow. The lowering of the groundwater level could therefore potentially lower the baseflow. The impacted area for the cone of depression is predominantly in the mine boundary area for the various sites with exception of KPSS.

The groundwater contamination plumes and decant at KPS and KPSX, are likely to have an impact on the water quality at the Saalklapspruit and Grootspuit.

Once decant (which is expected to be poor in quality) reaches the streams, the migration rate of the contaminants then flows at the rate of surface water (faster than groundwater) and could have a negative impact on the down-gradient riverine ecosystem and land owners should this seepage not be contained.

#### 8.2.5.1 On other water users

The proposed water uses under the Unwabu Project will have direct and indirect implications for both the water resource itself and the various stakeholders reliant on this resource. This section evaluates these effects comprehensively, considering potential impacts on other water users, the broader public, and property. The Unwabu Project is situated within a catchment area where multiple water users, including industrial, agricultural, and domestic sectors, rely on the available water resources. The potential effects of the proposed water uses on these stakeholders are assessed as follows:

- Quantity and Availability of Water:** The abstraction of water from surface and groundwater sources may reduce the volume available to downstream users. However, measures such as optimized water recycling and adherence to authorized abstraction limits will be implemented to mitigate these effects.
- Water Quality Impacts:** Mining operations pose risks of contaminant leaching, including elevated levels of heavy metals, suspended solids, and sulfates. Discharge of mine-affected water into local watercourses may alter the chemical composition of receiving waters. To minimize this, robust water treatment and monitoring programs will be enforced.

- ☛ **Interference with Groundwater Users:** The dewatering of underground workings could impact groundwater-dependent users by lowering the water table. Groundwater modelling and controlled dewatering strategies will be applied to reduce potential drawdown effects on private boreholes and agricultural wells.
- ☛ **Disruption to Existing Water Infrastructure:** The expansion of mining activities may require alterations to local drainage patterns and infrastructure. Engagement with affected water users and regulatory bodies will be conducted to ensure minimal disruption and alignment with existing water management plans.

### 8.2.5.2 *On the broader public and property*

The impacts of the Unwabu Project's water uses extend beyond direct water users to the broader public and surrounding properties, influencing socio-economic and environmental aspects. These impacts are analyzed as follows:

- ☛ **Public Health and Safety:** The potential release of contaminated water, if not properly managed, could pose health risks to local communities relying on surface and groundwater sources. The Project's water management plan includes stringent quality controls to ensure compliance with regulatory standards.
- ☛ **Flooding and Erosion Risks:** Modifications to natural drainage patterns, including stormwater diversions and increased impermeable surfaces, may lead to localized flooding and erosion. Engineering solutions such as stormwater management systems and erosion control structures will be implemented.
- ☛ **Impacts on Agricultural Land and Livelihoods:** Farmers in the region depend on consistent water supply for irrigation. Any significant change in water availability or quality could affect crop yields and livestock health. The Project will incorporate water conservation measures and explore supplementary water sources where necessary.
- ☛ **Socio-Economic Effects:** The broader public may experience both positive and negative socio-economic impacts due to the proposed water uses. On one hand, job creation and economic stimulation from mining activities will provide benefits. On the other hand, any reduction in water quality or availability could adversely affect local industries, requiring proactive engagement and mitigation strategies.
- ☛ **Biodiversity and Ecosystem Services:** Water-dependent ecosystems, such as wetlands and riparian zones, provide essential services including water purification and habitat for aquatic life. Disruptions to natural hydrological regimes could compromise these ecosystems. A biodiversity offset strategy, along with ongoing environmental monitoring, will be employed to minimize ecological degradation.

### 8.2.6 **The class and resource quality objectives of the water resource**

One of the fundamental principles on which the National Water Act (Act 36 of 1998) is based is the protection of water resources.

*"The quantity, quality and reliability of the water required to maintain the ecological functions on which humans depend shall be reserved so that the human use of water does not individually or cumulatively compromise the long-term sustainability of the aquatic and associated ecosystems"*

The water which is required to sustain the ecological functioning is referred to as the Reserve and enjoys priority of use by right.

The National Water Act (Act 36 of 1998) makes provision for the progressive development of integrated catchment management strategies for designated catchments. Such strategies must take into account:

- 🌿 The significance of the water resources within the catchment, according to the national classification system;
- 🌿 The resource quality objectives;
- 🌿 The Reserve of the water resources;
- 🌿 The water allocation plans.

The class of a water resource represents its ecological and socio-economic importance, with classification categories ranging from minimally modified (Class I) to heavily modified (Class III). These classifications are used to set Resource Quality Objectives (RQOs), which define specific goals for maintaining or improving the quality, quantity, and ecological state of the resource. These objectives take into account:

- 🌿 Water Quality: Ensuring water remains free from pollution that could harm aquatic life or human use.
- 🌿 Water Quantity: Maintaining adequate flow levels to sustain both ecological systems and authorized water users.
- 🌿 Ecological Functionality: Preserving biodiversity and the integrity of aquatic ecosystems.
- 🌿 Cultural and Social Significance: Recognizing the resource's value to local communities and stakeholders.
- 🌿 The DWS is responsible for determining these classes and RQOs and for setting limits on water use that align with the Reserve.

The wetland assessment has identified sensitive ecological areas that play a vital role in maintaining the integrity of the water resource. To safeguard these areas, the Project has incorporated robust engineering and environmental controls to mitigate potential impacts. Specifically, buffer zones around wetlands will be strictly maintained, and direct disturbances will be minimized through targeted operational planning.

Furthermore, the Project's comprehensive water management plan has been tailored to align with the RQOs set for the Olifants River catchment. These objectives are crucial for maintaining the ecological health and overall quality of the water resource. Arnot OpCo commits to ongoing compliance with these standards by implementing continuous monitoring programs, adaptive management practices, and stringent water treatment measures. This alignment ensures the preservation of both water quality and aquatic ecosystems, thereby contributing to the sustainable management of the catchment area.

### **8.2.7 Investment already made and to be made by the water user in respect of the water use in question**

Seriti Power has made significant investments in water infrastructure to ensure the sustainable and responsible management of water resources at Klipspruit Colliery. These investments align with regulatory requirements, best practices in environmental stewardship, and operational efficiency objectives. The financial and strategic commitments made by Seriti Power demonstrate its

long-term approach to responsible water use, emphasizing water conservation, pollution prevention, and continuous improvement in water management systems.

#### **8.2.7.1 Historical and Ongoing Investments**

Seriti Power has implemented a series of capital and operational investments aimed at optimizing water usage and ensuring compliance with environmental and water-use regulations. These investments include:

- 🌱 **Water Supply Infrastructure:** Development and maintenance of boreholes, pipelines, and pumping stations to ensure reliable water supply for mining and processing operations while minimizing reliance on external water sources.
- 🌱 **Water Treatment Facilities:** Investment in on-site water treatment plants to improve water recycling, reduce freshwater intake, and ensure that discharged water meets regulatory quality standards.
- 🌱 **Stormwater Management Systems:** Construction of diversion canals, containment dams, and stormwater management structures to prevent contamination of natural watercourses and enhance flood protection.
- 🌱 **Pollution Control Dams:** Development and maintenance of pollution control dams to capture and treat potentially contaminated runoff from operational areas, preventing uncontrolled discharge into surrounding water bodies.
- 🌱 **Water Monitoring and Compliance Programs:** Investment in advanced water quality monitoring systems, including real-time sensors, borehole monitoring, and laboratory testing to track and manage water quality and availability.

#### **8.2.7.2 Planned Investments for the Unwabu Project**

As part of the Unwabu Project, Seriti Power is committed to further enhancing its water management strategies by investing in additional infrastructure and technologies, including:

- 🌱 **Expansion of Water Recycling Systems:** Increasing the capacity of closed-loop water recycling facilities to further reduce freshwater withdrawal and improve water-use efficiency.
- 🌱 **Mine Water Treatment Plant Upgrade:** Upgrading the existing water treatment plant to incorporate advanced filtration and treatment technologies to meet evolving water quality regulations.
- 🌱 **Enhanced Sediment Control Measures:** Implementing improved sediment control measures, including silt traps and enhanced drainage systems, to minimize suspended solids in water runoff.
- 🌱 **Water Storage and Buffer Capacity Enhancements:** Increasing on-site water storage capacity to better manage water availability during dry seasons and reduce dependence on external water supplies.

#### **8.2.7.3 Socio-Economic and Environmental Benefits of Investments**

The investments made by Seriti Power contribute to long-term sustainability, benefiting both the mining operation and surrounding communities. Key benefits include:

- ✔ Improved Water Security: Ensuring stable and sustainable water supply for mining operations while minimizing impacts on local water users.
- ✔ Reduced Environmental Footprint: Enhanced water recycling and treatment measures reduce pollution risks and contribute to responsible water stewardship.
- ✔ Regulatory Compliance and Risk Mitigation: Continuous investments in water management infrastructure ensure compliance with national water regulations, minimizing legal and operational risks.

Community and Stakeholder Benefits: By reducing reliance on external water sources and minimizing environmental impacts, Seriti Power fosters positive relationships with local communities and stakeholders.

#### **8.2.7.4 Commitment to Continuous Improvement**

Seriti Power remains committed to ongoing research, monitoring, and adaptation of best practices in water resource management. Future investments will focus on integrating innovative water-saving technologies, improving efficiency, and ensuring the long-term sustainability of water use within the Unwabu Project.

### **8.2.8 The strategic importance of the water use to be authorized**

#### **8.2.8.1 Contribution to National Energy Security**

The proposed water use authorization for the Unwabu Project is of strategic national importance, as it directly supports South Africa's energy sector. Seriti Power is a key supplier of coal to Eskom, the state-owned electricity utility responsible for generating the majority of the country's power. Ensuring a reliable water supply for the Unwabu Project will enable continued coal production, which is critical for maintaining energy security and preventing power shortages that could have widespread economic and social consequences.

#### **8.2.8.2 Economic and Socio-Economic Contributions**

The mining operations at Klipspruit Colliery play a vital role in the local and regional economy, providing employment opportunities, supporting local businesses, and contributing to government revenue through taxes and royalties. The authorization of water use for the Unwabu Project will:

- ✔ Sustain direct and indirect employment, supporting thousands of workers and their families.
- ✔ Stimulate local procurement and business development, benefiting suppliers and service providers in the region.
- ✔ Generate economic growth in Mpumalanga, a key mining region in South Africa.
- ✔ Contribute to social and community development through corporate social investment programs.

#### **8.2.8.3 Alignment with National and Regional Water Resource Planning**

The authorization of water use for the Unwabu Project aligns with national and regional water resource management strategies, including:

- The National Water Resource Strategy (NWRS): Ensuring responsible and sustainable water use within the framework of equitable resource allocation.
- The Catchment Management Agency (CMA) Objectives: Supporting integrated water resource management at a regional level to balance industrial, environmental, and community water needs.
- The Olifants River Catchment Management Strategy: Aligning with catchment-specific water use priorities, including sustainable water allocation and pollution control.
- Seriti Power has committed to efficient water use and resource protection, ensuring that mining activities do not compromise the long-term sustainability of the water resource.

#### **8.2.8.4 Environmental Sustainability and Compliance**

The strategic authorization of water use for the Unwabu Project is crucial in maintaining environmental integrity and ensuring compliance with South Africa's regulatory framework. The Project incorporates:

- Water conservation measures, including enhanced water recycling and treatment processes to reduce freshwater demand.
- Pollution control initiatives, such as sediment traps, pollution control dams, and advanced water treatment technologies to minimize environmental impacts.
- Ongoing environmental monitoring and reporting to ensure compliance with water use license conditions and mitigate risks to surrounding ecosystems.

#### **8.2.8.5 Supporting Just Transition and Sustainable Mining Practices**

As South Africa moves towards a just energy transition, responsible mining operations play a crucial role in balancing energy needs with sustainability. The Unwabu Project is designed to implement best-practice water management strategies, supporting both continued coal production and long-term environmental stewardship.

### **8.2.9 The quality of water in water resource which may be required for the reserve and for meeting international obligations**

Section 16 of the National Water Act, 1998 (Act 36 of 1998), requires that the Minister of the Department of Water and Environmental Affairs determine the Reserve for the river system before any license can be issued. The Reserve consists of two parts: namely, the basic human needs and the ecological reserve, which must be determined for all or part of any significant water resource. The Reserve is basically a specification of the amount of water that must be present in water resources as well as the quality of the water for the water resource to remain ecologically healthy and to be able to provide water for basic human needs. The DWS is responsible to determine the Reserve.

Water quality monitoring will align with the DWS Resource Quality Objectives (RQOs). Mitigation strategies will include:

- Lined pollution control dams;

- ☛ Controlled release mechanisms to prevent acid mine drainage (AMD);
- ☛ Use of passive and active treatment technologies.

### 8.2.10 The probable duration of any undertaking to which the water is to be authorized

The underground sections (BCDE / BD / H) were designed to replace depleting opencast reserves. The LoM for BD/H from first development to last extraction is projected at ~2035–2037, depending on:

- ☛ market conditions
- ☛ panel sequencing
- ☛ development rate
- ☛ safety and geotechnical constraints

The expected LoM is 10–15 years from commencement of BD/H full production, which is the range already being used in Seriti's internal planning.

## 9 References

- Aurecon South Africa. 2017. Klipspruit Extension Project Feasibility: Water Balance GOLDSIM Model. Report No. KPSX-FS-16205-REP-WW-0001.
- Classes and Resource Quality Objectives of Water Resources for Catchments of the Olifants in terms of Section 13(1)(a) and (b) of the National Water Act (Act No. 36 of 1998).
- Climate-Data.org. 2019. "Climate Data for Location 652." Retrieved 25 February 2019 from <https://en.climate-data.org/location/652/>
- Department of Water and Sanitation (DWS). 1996. South African Water Quality Guidelines. Volume 7: Aquatic Ecosystems. Department of Water Affairs and Forestry, Pretoria.
- Department of Water and Sanitation (DWS). 1999. Resource Directed Measures for Protection of Water Resources. Volume 2: Integrated Manual (Version 1). Department of Water Affairs and Forestry, Pretoria.
- Department of Water and Sanitation (DWS). 2016. Risk-Based Water Use Authorisation Approach and Delegation Protocol for Section 21(c) and (i).
- de Villiers, M.C., Nell, J.P., Barnard, R.O., & Henning, A. 2003. Salt-Affected Soils: South Africa. ISCW Project GW56/003/20. Agricultural Research Council – Institute for Soil, Climate and Water, Pretoria.
- Digby Wells. 2015. Environmental Impact Assessment for KPSX: Weltevreden – Surface Water Report. Report No. BHP2690. Billiton Energy Coal South Africa (Pty) Ltd (BECSA).
- Digby Wells. 2017. Environmental Impact Assessment and Environmental Management Programme Alignment for Klipspruit Colliery, Mpumalanga Province – Surface Water Impact Assessment Report. Report No. SOU4087. Seriti SA Coal Holdings (Pty) Ltd.
- Digby Wells. 2020. Environmental Impact Assessment and Environmental Management Programme for Listed Activities associated with the Seriti Klipspruit Colliery Alignment Project. Report No. SOU4087. Seriti SA Coal Holdings (Pty) Ltd.
- GeoTerra Image. 2019. 2018 South African National Land-Cover Dataset. Pretoria, Gauteng.
- Golder Associates. 2017. Engineering Design Report: Wetland Rehabilitation Intervention Designs for the Klipspruit Extension Project (KPSX).
- Kotze, D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.C., & Collins, N.B. 2009. A Technique for Rapidly Assessing Ecosystem Services Supplied by Wetlands. Mondi Wetland Project.
- Land Type Survey Staff. 1972–2006. Land Types of South Africa: Digital Map (1:250 000) and Soil Inventory Databases. Agricultural Research Council – Institute for Soil, Climate and Water, Pretoria.
- Mucina, L., & Rutherford, M.C. 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Soil Classification Working Group. 2018. Soil Classification: A Taxonomic System for South Africa. Soil and Irrigation Research Institute, Department of Agricultural Development, Pretoria.

WR2012. 2016. Water Resources of South Africa, 2012 Study (WR2012). WRC Report No. TT 683/16. Water Research Commission, Pretoria.