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WETLAND AND AQUATIC ASSESSMENT FOR THE WASTEWATER TREATMENT WORKS AND DISCHARGE PIPELINE ASSOCIATED WITH THE KANGRA COAL (PTY) LTD MAQUASA MINE NEAR PIET RETIEF, MPUMALANGA PROVINCE

Version – final

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	Name	**Signature**	**Date**
Author	Magnus van Rooyen		September 2024
Director	Magnus van Rooyen		September 2024

CONTENTS PAGE

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

Declaration

I, Magnus van Rooyen, in my capacity as a specialist consultant, hereby declare that I:

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act (Act No. 107 of 1998);
- Have and will not have vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act (Act No. 107 of 1998);
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member;
- Based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability; and
- Reserve the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field.

Magnus van Rooyen (Pr.Sci.Nat) September 2024

SACNASP reg. no. 400335/11 Date

WETLAND AND AQUATIC ASSESSMENT FOR THE WASTEWATER TREATMENT WORKS AND DISCHARGE PIPELINE ASSOCIATED WITH THE KANGRA COAL (PTY) LTD MAQUASA MINE NEAR PIET RETIEF, MPUMALANGA PROVINCE

1 INTRODUCTION

Ecolink Consulting has been appointed by the GCS (Pty) Ltd to conduct a Wetland and Aquatic Assessment associated with the proposed Wastewater Treatment Works (WWTW) and discharge pipeline associated with the Kangra Coal (Pty) Ltd Maquasa Mine near the town of Piet Retief in the Mpumalanga Province.

The assessment will be submitted in support of the Waste Management Licence Application in accordance with the National Environmental Management: Waste Act (Act No. 59 of 2008), the Application for Environmental Authorisation in accordance with the National Environmental Management Act (Act No. 107 of 1998): Environmental Impact Assessment Regulations (2014), as amended and the Water Use Licence Application in accordance with the National Water Act (Act No. 36 of 1998).

2 PROJECT BACKGROUND

2.1 Project location and extent

Kangra Coal (Pty) Ltd's Maquasa mining operation is located near Piet Retief within the Mpumalanga Province. The mining area is situated approximately 45km west of Piet Retief and just off the N2 national road on a secondary road leading towards the Heyshope Dam. The Maquasa mining operations is made of the following mining areas:

- Maquasa East;
- Maquasa West; and
- Nooitgesien.

The location of the Maquasa Mine is provided in Figure 2-1.

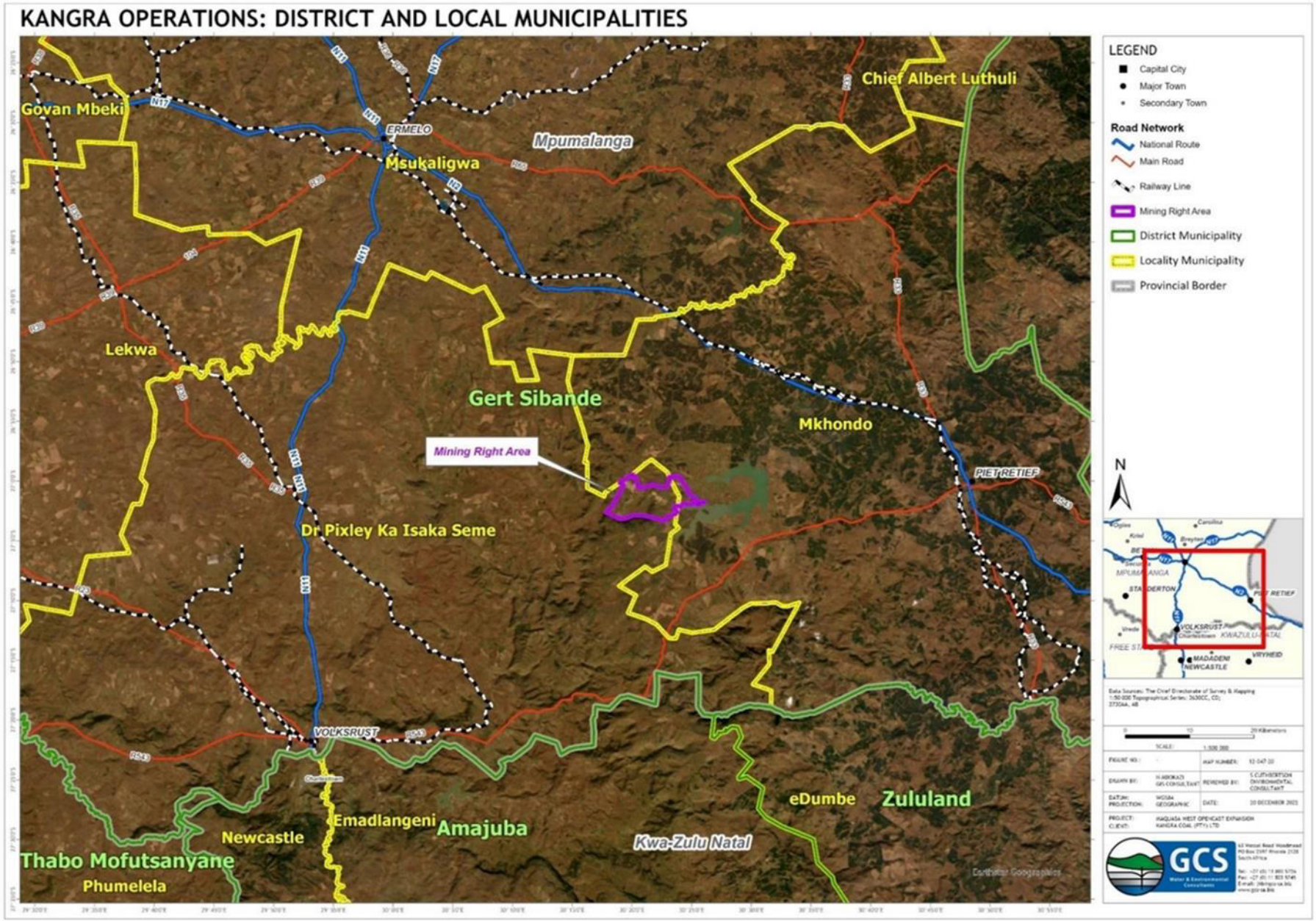


Figure 2-1: Location of the Maquasa Mine (map provided by GCS)

2.2 Project description

All the mining activities are undertaken and authorised under Mining Right (MR) MP30/5/1/23/2/1/133EM from the Department of Mineral Resources and Energy (DMRE).

All mining and project related infrastructure is located at Maquasa East and includes a coal washing plant and associated infrastructure. This plant is used for the processing of all coal mined from Maquasa West and the Nooitgesien opencast mining area. No mining is taking place at Maquasa East as all the coal reserves have already been mined.

The following existing infrastructure is located at Maquasa East:

- Offices;
- Workshop and ancillary buildings;
- Existing discard dump;
- Beneficiation plant;
- ENPROTEC plant;
- Diesel storage facilities;
- Dirty water containment facilities;
- Maquasa East Adit;
- Haul roads;
- Powerlines;
- Conveyors and associated service roads (transporting mined coal to the Maquasa East processing plant);
- Access roads;
- Pipeline (transporting water to the Maquasa East underground storage area);
- Crushers;
- Washing and screening plant; and
- Overburden and stockpile (i.e. topsoil, run of mine ore, product) dumps.

Kangra intends to construct a wastewater treatment works (see Figure 2-3), a HDPE pipeline transporting waste water from the approved Waste Disposal Facility, a treated effluent discharge pipeline, treated effluent discharge point on the Heyshope Dam and brine evaporation ponds at their Maquasa East operations. This new infrastructure forms the infrastructure focus of this assessment. The location and extent of the infrastructure is provided in Figure 2-2. Please note that the Waste Disposal Facility is authorised in accordance with an existing approval and not subject to this assessment.

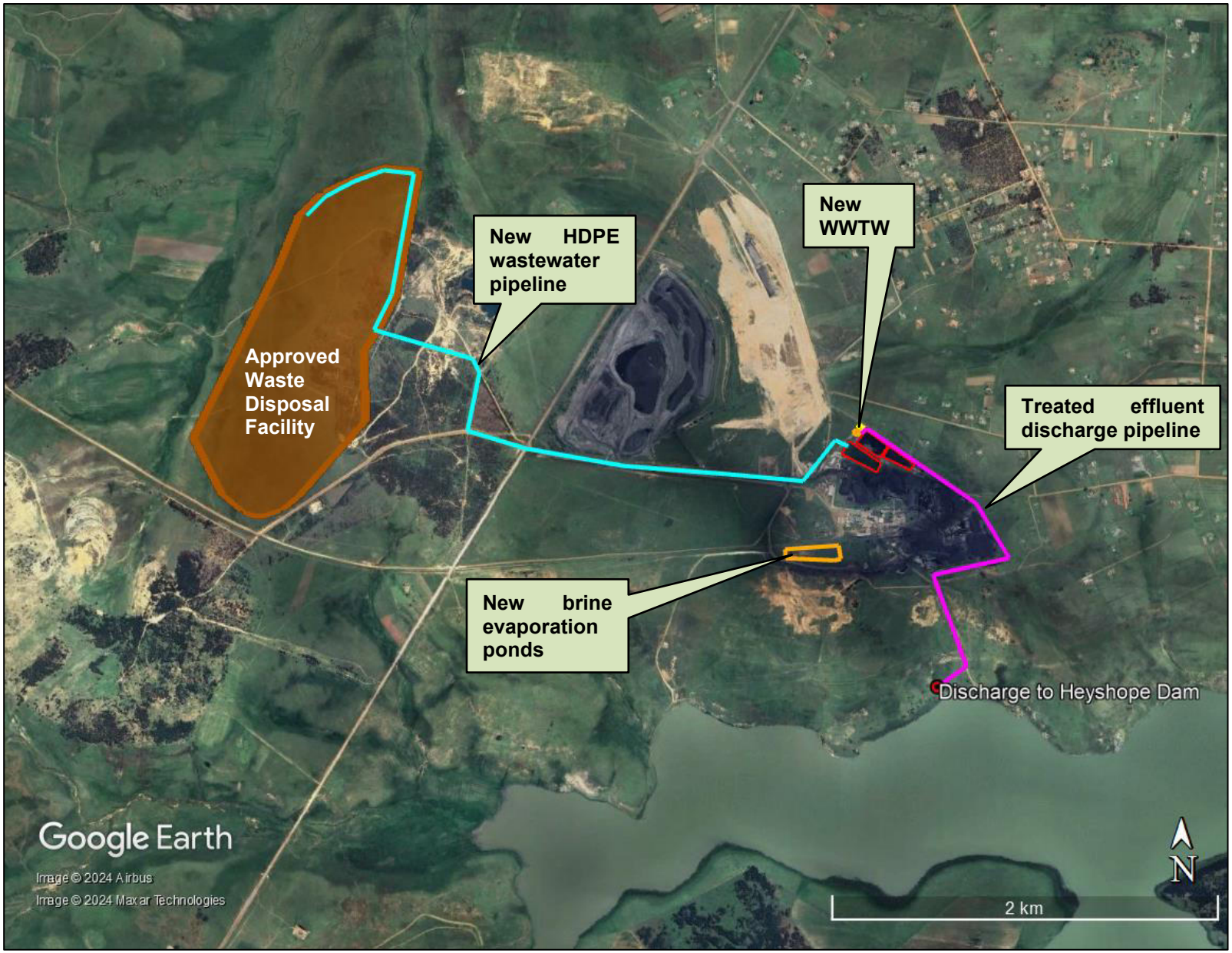


Figure 2-2: Layout and extent of the WWTW and associated pipelines

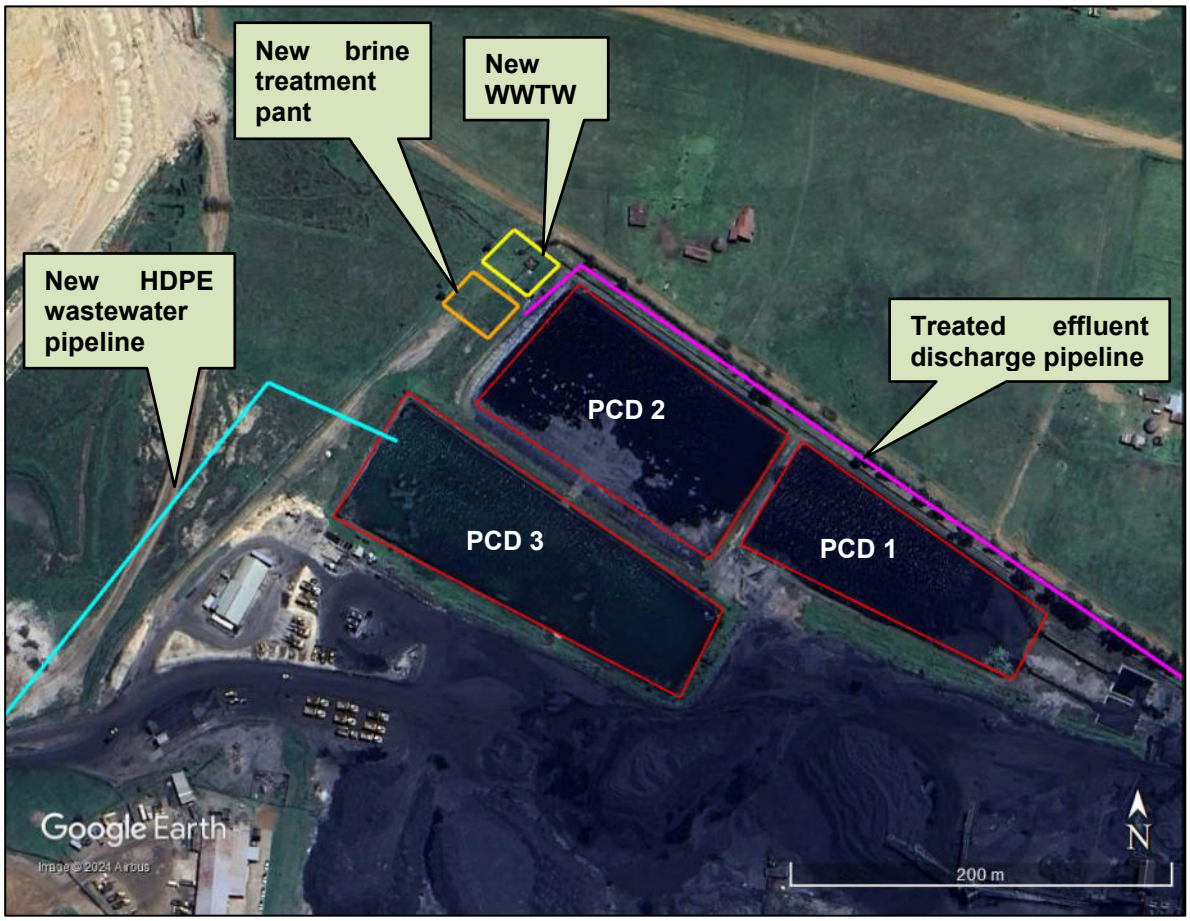


Figure 2-3: Layout of the WWTW (note that PCD 1, 2 and 3 are existing and approved)

3 APPLICABLE SOUTH AFRICAN LEGISLATION

The national and provincial legislation briefly described in this section relates directly with the legal aspects associated with the biodiversity associated with the project.

3.1 Applicable National Legislation

The project applicable environmental related National Legislation is provided in Table 3-1.

Table 3-1: Applicable National Legislation

Legislation	Description
Constitution of the Republic of South Africa (Act No. 108 of 1996)	According to the South African Constitution, South African citizens have the right to have the environment protected for the benefit of the present and future generations.
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	This Act includes the use and protection of land, soil, wetlands and vegetation and the control of weeds and invader plants. In the regulations published in 1984 under the Act, which declared approximately 50 plant species as “weeds” or “invader plants”. This list was further expanded on 30 March 2001 to now contain a comprehensive list of declared weed and invader plant species.
White Paper on Environmental Management Policy for South Africa (1998)	Through this Policy, the government of South Africa commits to give effect to the many rights in the Constitution that relate to the environment.

Legislation	Description
National Veld and Forest Fire Act (Act No. 101 of 1998)	The purpose of the Act is to prevent and combat veld fires in the country. The Act was amended by the National Forest and Fire Laws Amendment Act (Act No. 12 of 2001).
National Water Act (Act No. 36 of 2998)	This Act recognises that water is a scarce and unevenly distributed natural resource that should be equitably utilised in a sustainable manner. The Act ensures that water resources are protected, used, developed, conserved and controlled in ways that take into account a range of needs and obligations, including the need to "protect aquatic and associated ecosystems and their biological diversity". The Act further specifies the water uses that must be authorised and it details the authorisation procedures as well as the minimum requirements for evaluation and decision-making by the relevant authority.
National Forests Act (Act No. 84 of 1998)	An objective of the Act is to provide special measures for the protection of certain forest and tree species, and to promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes. In terms of Section 15(1) of the Act, forest trees or Protected Tree Species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by the relevant authority. Government Notice 35648 of 2012 provides the latest List of Protected Tree Species within the borders of South Africa.
National Environmental Management Act (Act No. 107 of 1998	The Act is an umbrella act covering broad principles of environmental management which makes provision for three main areas, namely Land Planning and Development, Natural and Cultural Resources Use and Conservation and Pollution Control and Waste Management. In accordance with the Act, sustainable development requires the consideration of all relevant factors, including: • That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; • That the use and exploitation of non-renewable natural resources are conducted in a responsible and equitable manner and takes into account the consequences of the depletion of the resource; and • That the development, use and exploitation of renewable resources and the ecosystems of which they are part of do not exceed the level beyond which their integrity is jeopardised. According to Section 2(r) of the Act, sensitive, vulnerable, highly dynamic or stressed ecosystems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	The Act focuses on the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural land-and seascapes. The Act addresses inter alia: • The protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural land- and seascapes; • The establishment of a national register of all national, provincial and local protected areas; • The management of those areas in accordance with national standards; and • Inter-governmental co-operation and public consultation in matters concerning protected areas.

Legislation	Description
National Environmental Management: Waste Act (Act No. 59 of 2008)	The Act serves to reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for: • the prevention of pollution and ecological degradation and for securing ecologically sustainable development; • to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; • to provide for the licensing and control of waste management activities; • to provide for the remediation of contaminated land; to provide for the national waste information system; • to provide for compliance and enforcement; and • to provide for matter connected therewith.
National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	The main objective of the act is to provide for the management and conservation of South Africa's biodiversity and to ensure the sustainable use of indigenous biological resources. In addition to regulations on Threatened, Protected, Alien and Invasive Species in South Africa, the Act also identifies Terrestrial and Aquatic Priority Areas and Threatened Ecosystems for biodiversity conservation.

4 TERMS OF REFERENCE

It is understood that the assessment will be submitted as part of the Application for Environmental Authorisation in accordance with the National Environmental Management Act (Act No. 107 of 1998): Environmental Impact Assessment (EIA) Regulations (2014) and an Application for a Waste Management Licence in accordance with the National Environmental Management: Waste Act (Act No. 59 of 2008). In addition, the assessment will be submitted in support of a Water Use Licence Application in accordance with the National Water Act (Act No. 36 of 1998).

As such, the assessment will be completed in accordance with the requirements of the abovementioned Acts and will focus on the potential impacts that the project may have on the identified aquatic features within the study site. The assessment will make provision for the following regulated requirements:

- Location of the activity within the "regulated area of a watercourse" as defined by the Act;
- An identification of all the aquatic features within the determined "regulated area of a watercourse";
- A delineation of all these identified aquatic features to determine their extent, the delineation will be conducted in accordance with the Department of Water Affairs and Sanitation's guideline on the delineation of these features;

- An assessment of the identified aquatic features to determine their hydrogeomorphic classification, their present ecological state (PES), the ecosystem services they provide as well as their ecological importance and sensitivity (EIS);
- Identification of the potential impacts of the proposed activity on the identified aquatic features;
- An impact assessment with the provision of management and mitigation measures; and
- A Risk Assessment Matrix that follows the Department of Water and Sanitation protocols.

In brief, these requirements have as an outcome to achieve the following:

- A methodology of the site visit and techniques used to assess the specific aspects of the site;
- Details of the assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of site plan identifying site alternatives (where applicable);
- An indication of any areas that are to be avoided, including provision of buffers (where applicable);
- A description of any assumptions made and any uncertainties or gaps in knowledge;
- A description of the findings and potential implications of such findings on the impact of the proposed activities;
- Any mitigation measures for inclusion in the Environmental Management Programme Report (EMPr);
- Any conditions for inclusion in the Environmental Authorisation, Waste Management Licence and the Water Use Licence;
- Any monitoring requirements for inclusion into the EMPr or Water Use Licence; and
- A reasoned opinion whether the activity should be authorised based on the findings of the assessment.

5 ASSUMPTIONS AND KNOWLEDGE GAPS

The following are assumptions made in the completion of the report:

- The assessment of the potential impacts of the proposed development on the aquatic features on the development site is based on the development layout that has been provided. If the development layout is amended, the impact identification and assessment contained in this report may also change.
- The findings of the report are limited to a two-day long site visit conducted on 18 May 2023 which is considered to be autumn to early winter. No provision has been made for seasonal visits to the site and is not considered a shortcoming of the report.
- The identification and delineation of the aquatic features that have been assessed within the study area was conducted in terms of the procedures as specified by the Department of Water and Sanitation.
- The classification of any identified aquatic features has been conducted in accordance with the classification system of inland aquatic ecosystem as prescribed by Ollis *et al.,* 2013.
- The following desktop information was used to augment the finding of the assessment:
    - Electronic biodiversity databases managed by the South African National Biodiversity Institute (SANBI);
    - Available provincial electronic biodiversity databases;
    - Wetland and Riparian Habitat Delineation Document (Department of Water and Sanitation report); and
    - Classification system for wetlands and other aquatic ecosystems in South Africa (Inland Systems) (Ollis et al., 2013 – SANBI Biodiversity Series 22).

6 REPORTING CONDITIONS

The following conditions apply to the report in part or as a whole:

- The findings and conclusion of this report are based on the author's scientific and professional knowledge as well as available information at the time of the assessment. In addition, the recommendations made are considered to be the best, implementable actions that can be taken to alleviate the identified impacts.
- As such, the author accepts no liability for any actions, claims, demands, losses, liabilities, costs, damages, and expenses that may arise from or in connection with the services rendered, and by any use of the information contained in this document.
- No part of this report may be amended without written consent from the author.

7 EXPERTISE OF THE SPECIALIST

Mr Magnus van Rooyen is a registered natural scientist with the South African Council of Natural Scientific Professions (SACNASP) and holds a Master's degree in Environmental Management, a BSc Honours degree in Botany and a BSc degree in Botany and Zoology from the University of Stellenbosch. Mr van Rooyen has in excess of 25 years' experience in the field of wetland and terrestrial ecological studies in Southern and Western Africa. The *curriculum vitae* of the specialist, Mr Magnus van Rooyen is attached in Appendix A.

8 METHODOLOGY

The methodology that was followed in completing this study is in line with the requirements and specifications of the Department of Water and Sanitation and includes the following aspects. In addition, provision is made to conduct an assessment to meet the extended aspects included in the Scope of Works.

8.1 Identification of aquatic features and mapping

The initial identification process for aquatic features was conducted at a desktop level during which available GIS databases were interrogated to determine the presence of any wetland and watercourse areas that have been determined in the past. The key database that was interrogated was the National Freshwater Ecosystem Priority Area (NFEPA) as managed and updated by the South African National Biodiversity Institute (SANBI) as well as the updated version of this dataset, the Wetland MAP5 (2018).

In addition to the database interrogation, the most recent Google Earth and Zoom Earth Imagery of the site was considered to see if any wetland areas or "anomalies" within the site are visible.

Following the desktop assessment of the site, a site visit was conducted on 18 May 2023. During the site visit, the potential aquatic features identified through the desktop assessment were verified and any other aquatic features were identified and their boundaries accurately delineated.

8.2 Aquatic feature delineation

The delineation of these wetlands areas was conducted in accordance with the Department of Water and Sanitation, *"A practical field procedure for identification and delineation of wetlands and riparian areas"* (2005).

This field guide makes use of several specific indicators which show the presence and the boundaries of wetlands. The presence of the following indicators was used during the identification and delineation of the site:

- ***Terrain Unit Indicator*** – Identification of the part of the landscape where wetlands are more likely to occur;
- ***Soil Form Indicator*** – Identification of the soil types which are associated with prolonged and frequent saturation;
- ***Soil Wetness Indicator*** – Identification of the morphological signatures that develop in soil profiles as a result of prolonged and frequent saturation; and
- ***Vegetation Indicator*** – Identification of the hydrophilic vegetation associated with frequently saturated soil.

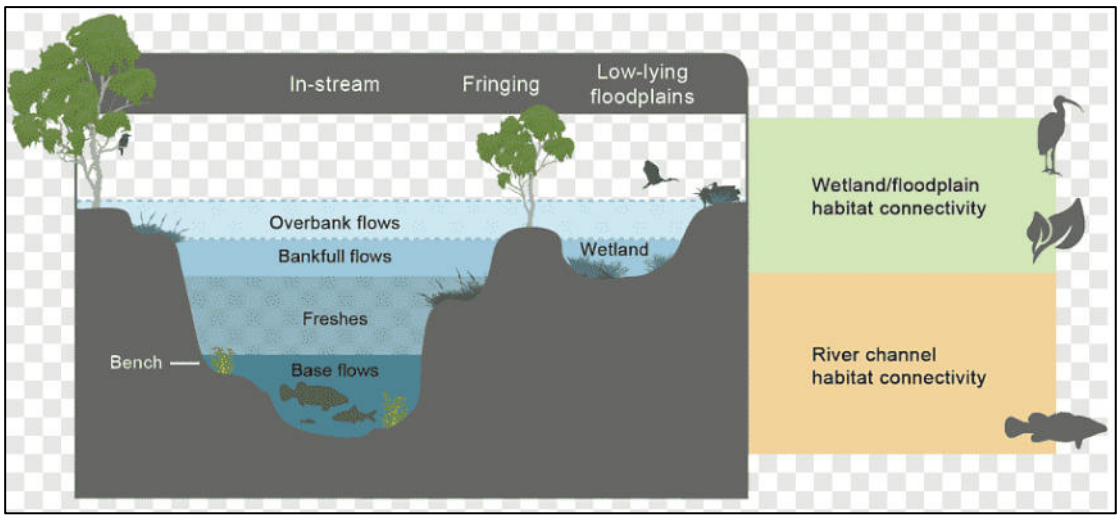
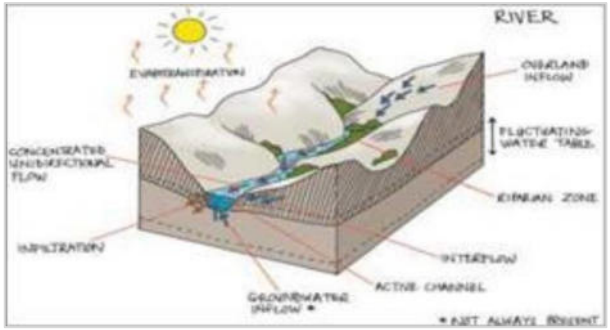
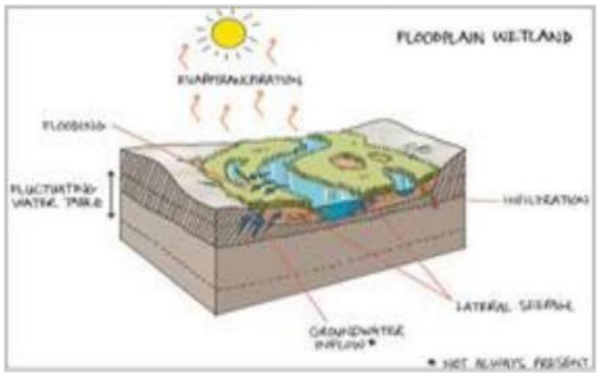
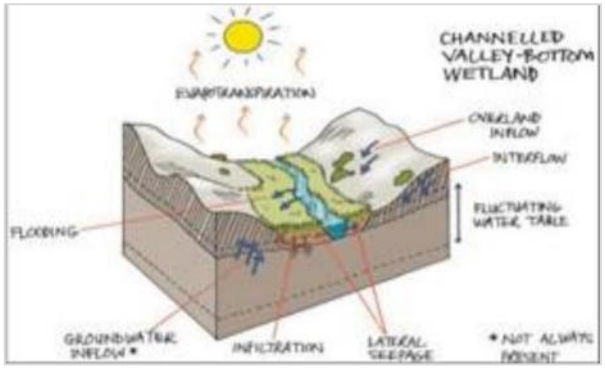
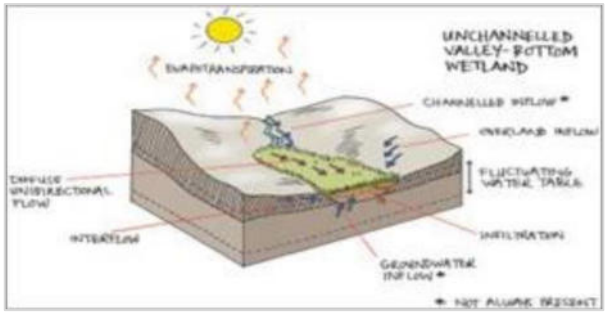
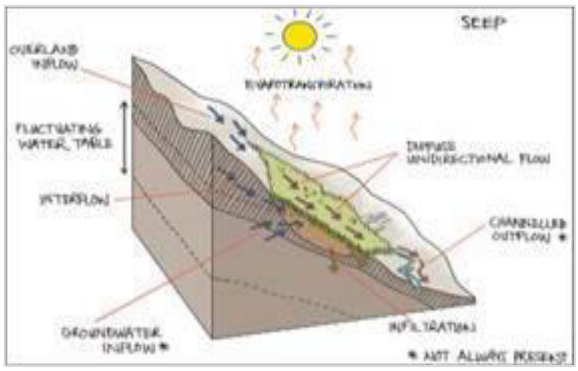


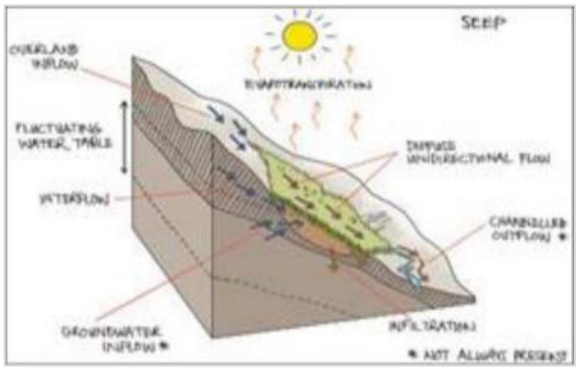
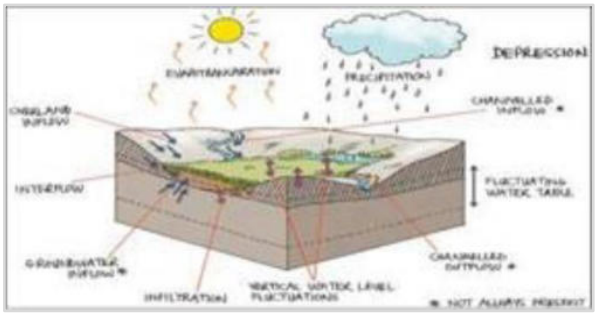
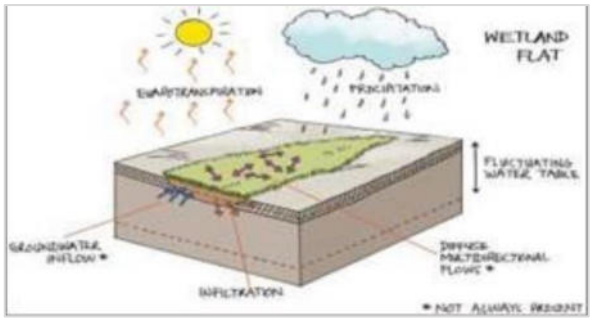
Figure 8-1: Cross section through a typical drainage basin (www.pngegg.com)

Following the identification of the aquatic features on the study site, these are then classified into specific hydrogeomorphic (HGM) units according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa (inland systems) (Ollis et al., 2013).

Table 8-1: Wetland hydrogeomorphic (HGM) types typically supporting inland wetlands in South Africa (Ollis *et al.*, 2013)

Hydrogeomorphic types		Description
River		Rivers are linear landforms with clearly discernible banks and a channel, which permanently or periodically, carries a contained and defined flow of water. A river is taken to include both the active channel and the riparian zone.

Hydrogeomorphic types		Description
Floodplain		Valley bottom areas with a well-defined stream channel, gently sloped and characterised by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.
Valley bottom with channel		Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterised by the net accumulation of alluvial deposits or may have steeper slopes and be characterised by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.
Valley bottom without a channel		Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterised by alluvial sediment deposition generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.
Hillslope seepage linked to a stream channel		Slopes on hillsides, which are characterised by the colluvial (transported by gravity) movement of materials. Water inputs are mainly sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.

Hydrogeomorphic types		Description
Isolated Hillslope seepage		Similar to other hillslope seeps but with no direct surface water connection to a stream channel. Slopes on hillsides, which are characterised by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow primarily by diffuse sub-surface and/or limited surface flow.
Depression (includes Pans)		A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.
Wetland Flat		A flat wetland with no apparent inlet or outlet points. Water is obtained from surface or near surface flows and is lost either by downward percolation or evapotranspiration. May be only seasonal in terms of its wetness and hydromorphic soils may be only weakly developed or else be absent. Vegetation may be the strongest indicator.

8.3 Riparian Delineation

The delineation of the riparian areas was conducted in accordance with the Department of Water and Sanitation document, “A practical field procedure for identification and delineation of wetlands and riparian areas” (2005).

Like wetlands, riparian areas have their own unique set of indicators. It is possible to delineate riparian areas by checking for the presence of these indicators. The riparian delineation process takes the following physical aspects into consideration:

- ***Topography associated with the watercourse*** – The topography is a good rough indicator of the outer edge of the riparian area as the riparian edge is the same as the edge of the macro channel bank.

- ***Vegetation*** – The delineation of riparian areas relies primarily on the vegetative indicators. Using vegetation, the outer boundary of a riparian area must be adjacent to a watercourse and can be defined as the zone where a distinctive change occurs:
    - In species composition relative to the adjacent terrestrial area; and
    - In the physical structure, such as vigour or robustness of growth forms of species similar to that of adjacent terrestrial areas. Growth form refers to the health, compactness, crowding, size, structure and/or numbers of individual plants.
- ***Alluvial soils and deposited material*** – Alluvial soils can be defined as relatively recent deposits of sand, mud, etc. set down by flowing water, especially in the valleys of large rivers. Riparian areas often, but not always, have alluvial soils.

8.4 Aquatic features functional Assessment

Once the aquatic features have been identified and their boundaries determined, the assessment of the ecosystem services these features provide to the hydraulic system that they contribute to, as well as the immediate natural and social environment, was undertaken. An understanding of this functionality of these features contributes directly to the level of importance that is attributed to the specific feature that is developed. The assessment was conducted by using a modelling tool that forms part of the WET-Management Series (issued by the Water Research Commission), WET-EcoServices (Kotze *et al*. 2008).

The WET-EcoServices tool makes provision for the rapid assessment of the ecosystem services provided by an aquatic feature. The process of applying the tool is based on the characterisation of hydrogeomorphic aquatic feature types based on desktop and field assessment and observations of identified and delineated aquatic features. This model, furthermore, considers the biophysical and social conditions around a feature and converts these considerations into a fixed score for a series of defined ecosystem services that the wetland delivers.

- Flood Attenuation
- Sediment trapping
- Nitrate Assimilation
- Erosion control
- Maintenance of biodiversity
- Provision of harvestable resources
- Streamflow regulation
- Phosphate assimilation
- Toxicant Assimilation
- Carbon storage (sequestration)
- Provision of water for human use
- Provision of cultivated food

- Cultural significance
- Tourism and recreation
- Education and research

The maximum score for any service is a value of 4 and the rating of the probable extent of the service is shown in the table below.

Table 8-2: Ecoservices rating of the probable extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

8.5 Determining the Present Ecological State of a water resource

The determination of the present ecological state (PES) of a water resource was conducted by using a tool from the WET-Management Series (issued by the Water Research Commission), the WET-Health (Macfarlane et al. 2008).

This tool is designed to assess the health or integrity of an aquatic feature. The health of the aquatic feature is defined as a measure of the deviation of feature in structure and function from the it's natural reference condition. The tool therefore attempts to assess the hydrological, geomorphological and vegetation impacts that has been imparted on the wetland at the time of assessment.

The overall approach is to quantify the impacts of human activity or clearly visible impacts on the health of the aquatic feature, and then to convert the impact scores to a PES score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The impact scores and Present State categories are provided in the tables below.

Table 8-3: The magnitude of impacts on wetland functionality (Macfarlane et al, 2008)

Impact Category	Description	Score
None	No Discernible modification or the modification is such that it has no impacts on the wetland integrity	0 to 0.9
Small	Although identifiable, the impact of this modification on the wetland integrity is small.	1.0 to 1.9
Moderate	The impact of this modification on the wetland integrity is clearly identifiable, but limited.	2.0 to 3.9
Large	The modification has a clearly detrimental impact on the wetland integrity. Approximately 50% of wetland integrity has been lost.	4.0 to 5.9
Serious	The modification has a highly detrimental effect on the wetland integrity. More than 50% of the wetland integrity has been lost.	6.0 to 7.9
Critical	The modification is so great that the ecosystem process of the wetland integrity is almost totally destroyed, and 80% or more of the integrity has been lost.	8.0 to 10

The level of impacts on these three parameters is a direct indication of the PES of the aquatic feature as well as its functionality. An aquatic feature that has undergone severe impacts on its hydrology, geomorphology or vegetation or a combination of all three will reflect a low present ecological state while the converse is also true for pristine features. Since hydrology, geomorphology and vegetation are interlinked in the model, their scores are aggregated to obtain the overall PES health score using the formula:

Health = ((Hydrology value x 3) + (Geomorphology value x 2) + (Vegetation value x 2))/7

Table 8-4: Definitions of the PES categories (Macfarlane *et al*, 2008)

Impact Category	Description	Impact Score Range	Present State Category
None	Unmodified, natural	0 to 0.9	A
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	Critical Modification. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

8.6 Determining the Ecological Importance and Sensitivity of aquatic features

The outcomes of the implementation of the WET-EcoServices tool discussed above, is key in the determination of the ecological importance and sensitivity of aquatic features as the results is a direct indication of the contribution that the feature is making to the hydraulic system with which it is linked. This contribution is linked to the sensitivity of this feature to any possible change and how this will impact on the hydraulic system it is linked to.

8.7 Ecological Classification and Description

The ecological classification and description are direct results of the implementation of the methodology and tools described above as the results of these determinations contribute to the understanding of the ecology of the aquatic feature. The description of the aquatic feature will therefore make provision for a description of the physical attributes of the feature (location, size, etc.), the ecosystem services that it provides, the current ecological state of the feature and the importance of the feature and its sensitivity.

9 DESCRIPTION OF THE STUDY SITE

9.1 Climate

Driefontein normally receives about 738mm of rain per year, with most rainfall occurring during summer. The lowest rainfall is received in June (2mm) and the highest in December (136mm). The average daily maximum temperatures range from 18.8°C in June to 25.9°C in January. The region is the coldest during June with temperatures of 2.4°C on average during the night (www.meteoblue.com).

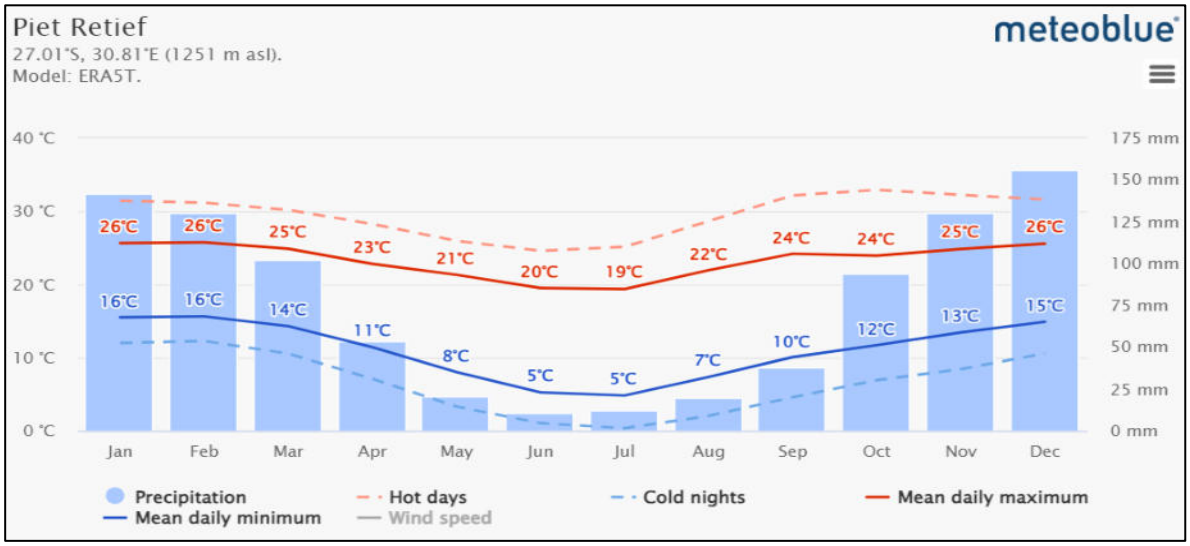


Figure 9-1: Average climatic conditions of the town of Piet Retief (source www.meteoblue.com)

9.2 Vegetation

The project site is located in the Eastern Highveld Grassland (Gm12) vegetation unit and is distributed along slightly, to moderately undulating plains, including some low hills and pan depressions, in Mpumalanga and Gauteng Provinces. The vegetation is short dense grassland dominated by the usual Highveld grass composition (*Aristida, Digitaria, Erigrostis, Themeda, Tristachya,* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Senegalia caffra, Celtis Africana, Diospyros lyciodes* subsp *lycioides, Parinari capensis, Protea caffra, P. welwitschii* and *Rhus magalismontanum*).

The location of the project site in the southern limb of the vegetation type is provided in Figure 9-2.

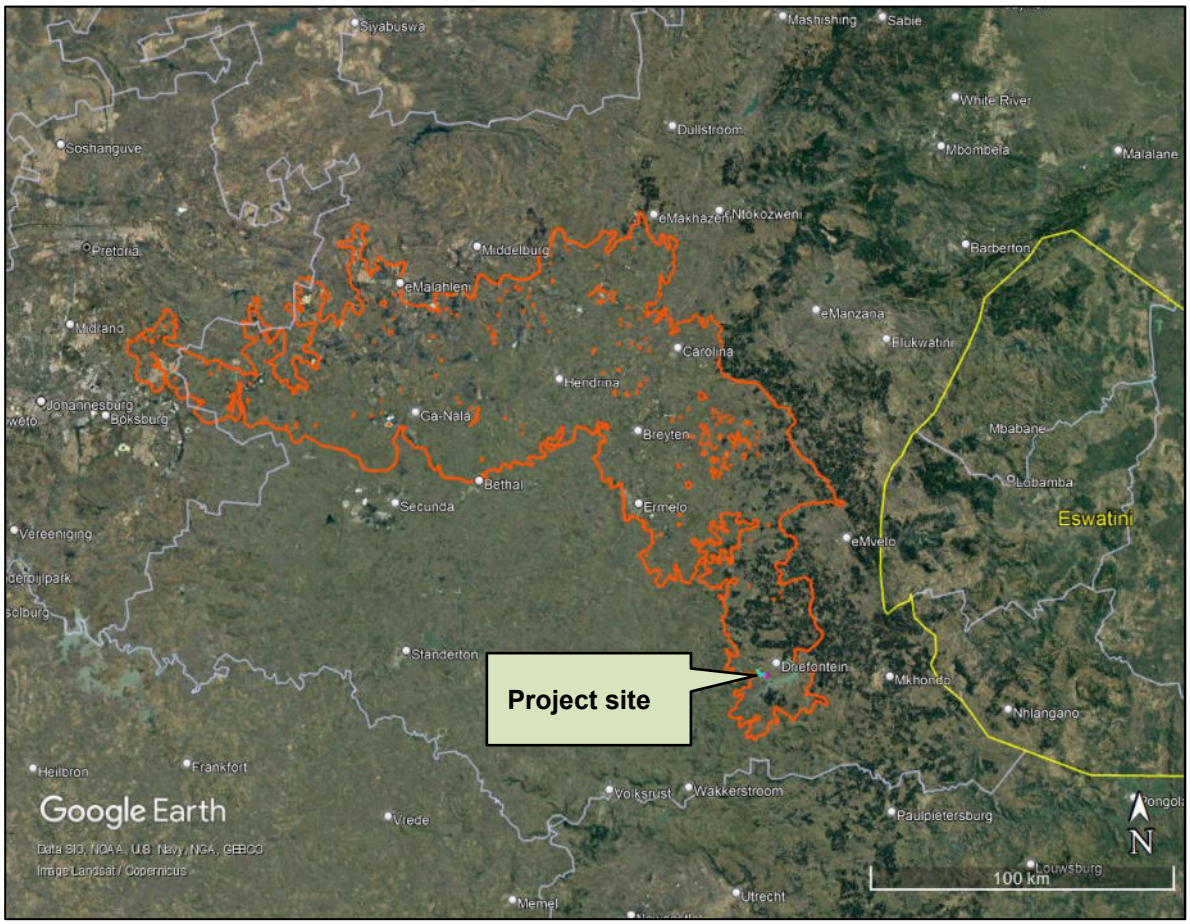


Figure 9-2: Extent of the Eastern Highveld Grassland (Gm12)

Plate 9-1: View of the vegetation, on and surrounding the project site

9.3 Topography

The topography of the study site comprises mostly, of undulating hills and plains. The altitude ranges from 1 300m to 1 600m and watercourses (perennial and non-perennial) and wetlands were often present in the troughs of the hills. Based on the observed topography one could expect to find wet soils in the troughs and more freely drained soils on the slopes and crests. The site falls within the W51B quaternary catchment.

The topography plays a major role in the depth of the soil found *in-situ*. Steeper gradients often have soils that are shallow and easily erodible. This higher risk of erosion can cause problems on site. Fortunately, from the site visit the majority of the area seems to have a gentle gradient and thus limits the potential of erosion.

This area has a relatively high diversity of surface water. The project area lies to the northwest and adjacent of the Heyshope Dam, this is a very large dam approximately 20km in length and 3km at its widest point. This dam could be seen as a very important water source and therefore extra care should be taken not to affect it. The Heyshope Dam has been built on the Assegaai River which flows to the south of the project area in an easterly direction.

Plate 9-2: View of the topography of the surrounding areas, looking in a southerly direction towards the Heyshope Dam

9.4 Land cover and land use

The current land use in the are consist of infrastructure associated with the operations of the coal mine as well as open areas consisting of indigenous grasses typical to transformed areas.

Plate 9-3: View of the mine access road and conveyor system associated with the mining operations

10 DESKTOP ASSESSMENT FINDINGS

The findings relating to the aquatic ecology is based on the desktop assessment of available databases as well as site investigations.

10.1 Study site definition

The definition of the assessment area is based on the requirements of the Department of Water and Sanitation that relates to the determination of the “regulated area of a watercourse” as it relates to a 500m radius from any delineation wetland features. The extent of the study site is provided in Figure 10-1.

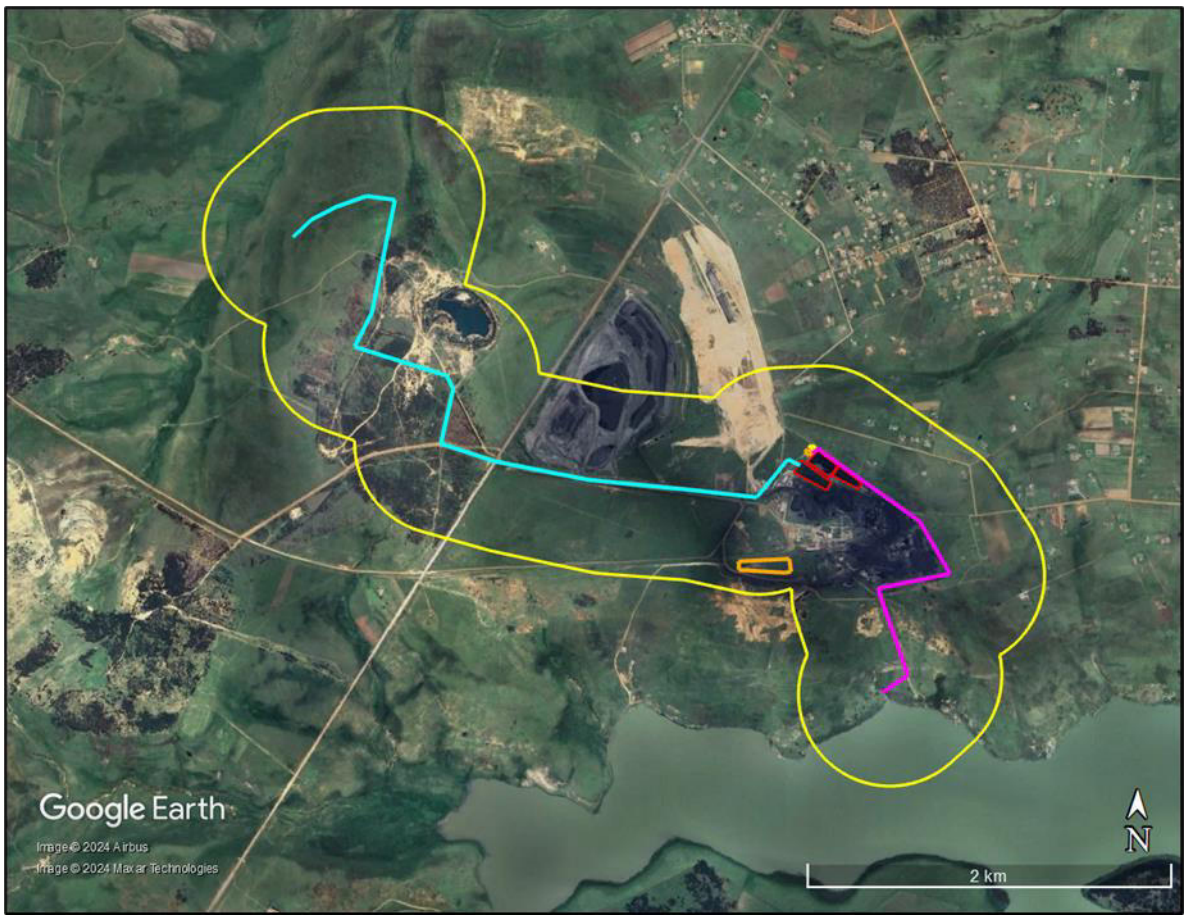
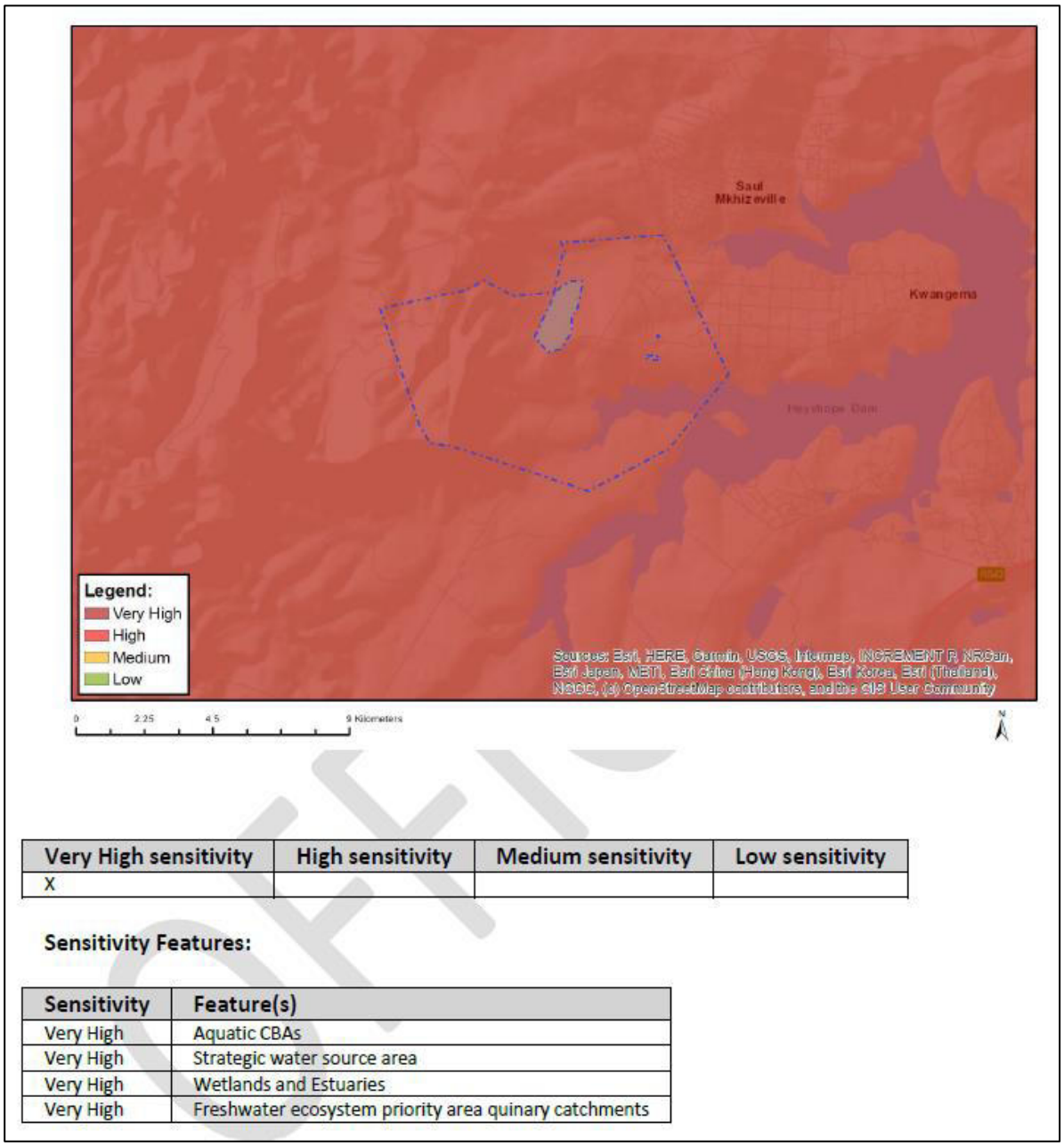


Figure 10-1: Extent of the study site, shown in yellow around the project site

10.2 Department of Forestry, Fisheries and Environment (DFFE) Online Screening Tool

The results generated by the DFFE Online Screening Tool has classified the Aquatic Theme sensitivity to be “VERY HGH” due to the presence of the project site within the following strategic environmental plans:

- Aquatic Critical Biodiversity Area in accordance with the Mpumalanga Biodiversity Sector Plan (2014);
- Strategic Water Resource Area in accordance with the Mpumalanga Biodiveristy Sector Plan (2014);
- Freshwater Ecosystem Priority Area quinary Catchment in accordance with the NFEPA dataset (2014); and
- The presence of wetlands within project site.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Aquatic CBAs
Very High	Strategic water source area
Very High	Wetlands and Estuaries
Very High	Freshwater ecosystem priority area quinary catchments

Figure 10-2: Results for the Aquatic Theme as per the DFFE Screening Tool

10.3 Hydrological setting

The results of the desktop assessment of the hydrological characteristics of the study site are provided in the table below.

Table 10-1: Desktop hydrological characteristics of the study site

Hydrological characteristic	Result	Comment
Water Management Area	Inkomati - Usuthu	
Primary Catchment	Primary region W	
Tertiary Catchment	W51	
Quaternary Catchment	W51B	The dominant rivers in the Quaternary Catchment are the Assegaai and Ngulane Rivers that drains the catchment in an easterly direction (see Figure 10-3). Both these rivers are classified as NFEPA Rivers and has been classified as Class C features

Hydrological characteristic	Result	Comment
		which means that they are Moderately Modified.

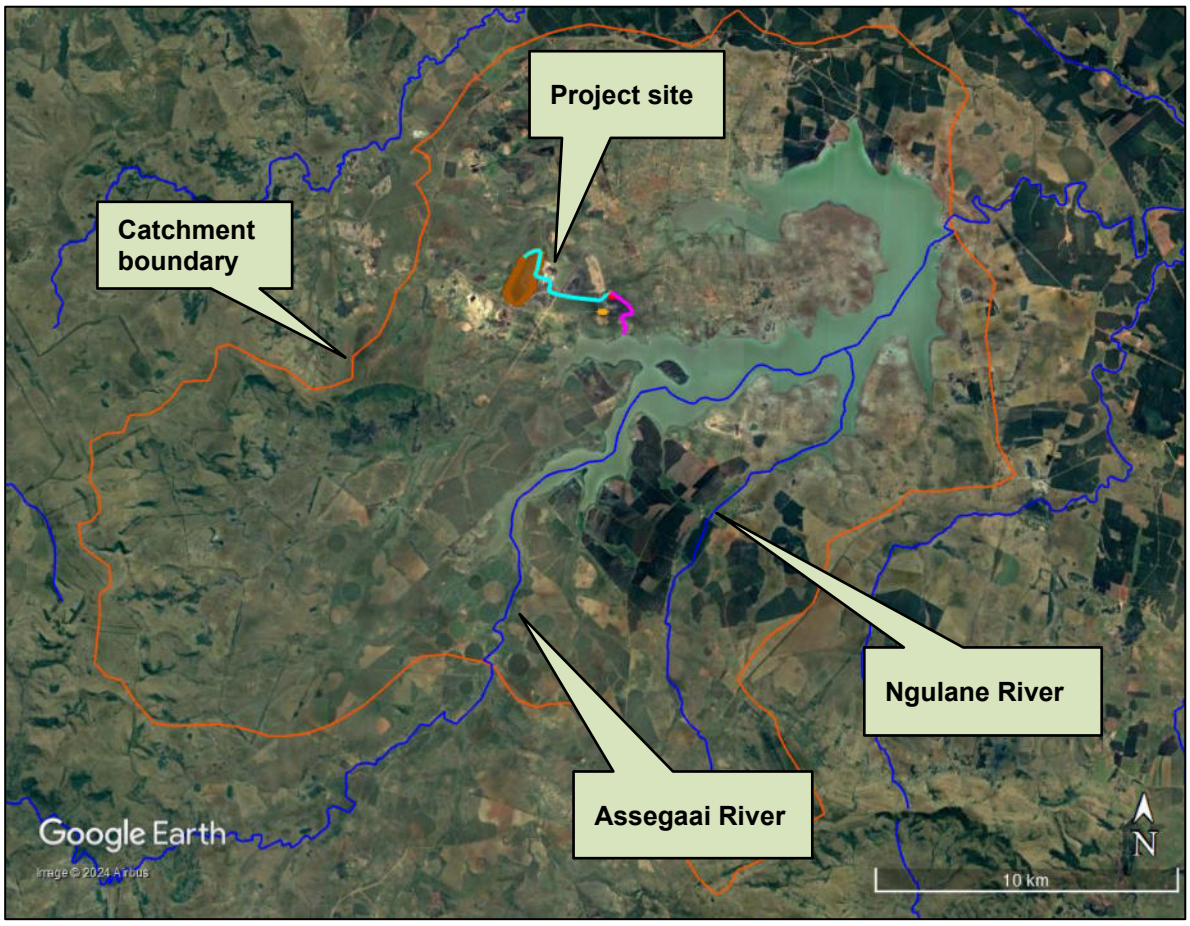


Figure 10-3: Location of the NFEPA Rivers identified in the NFEPA Database for Quaternary Catchment W51B

No NFEPA Rivers were identified to be within the boundaries of the project site.

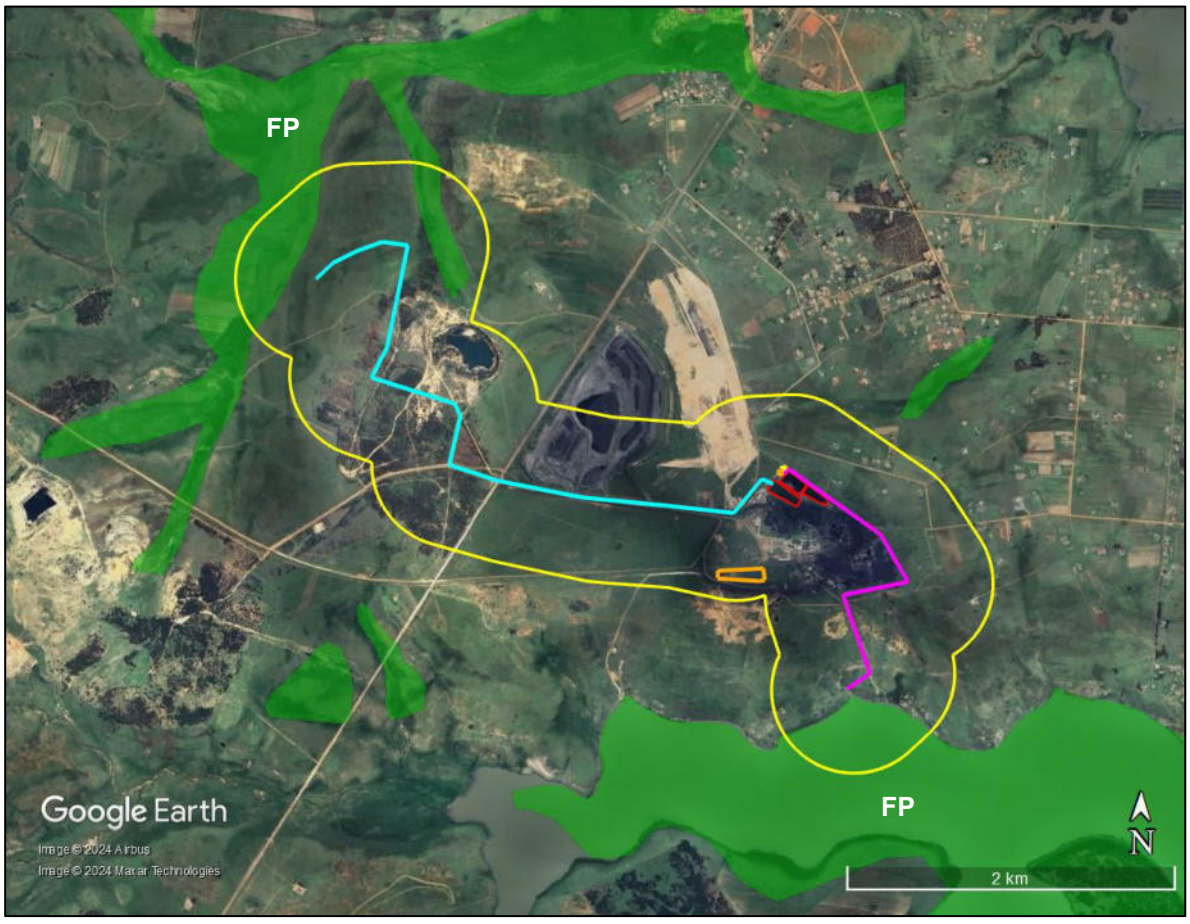
10.4 National Freshwater Ecosystem Priority Areas (NFEPA)(2014):

The National Feshwater Ecosystem Priority Areas (NFEPA) project provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. The priority areas are called Freshwater Ecosystem Priority Areas, or "FEPAs". The FEPAs were identified based on:

- Representation of ecosystem types and flagship free-flowing rivers;
- Maintenance of water supply areas in areas with high water yield;
- Identification of connected ecosystems;
- Representation of threatened and near-threatened fish species associated with migration corridors;

- Preferential identification of FEPAs that overlaped with:
    - Any free-flowing river;
    - Priority estuaries identified in the National Biodiversity Assessment (2011); and
    - Existing protected area and focus area for protected area expansion identified in the National Protected Area Expansion Strategy.

Based on the above criteria, the database has identified two wetland features within a 500m radius of the project site. The location of these wetland features is project site is provided in Figure 10-4. The database identifies both the wetland features as Floodplain wetlands. The Floodplain wetland located to the south of the study site is artificial in nature and consists of the Heyshope Dam.



FP = Floodplain

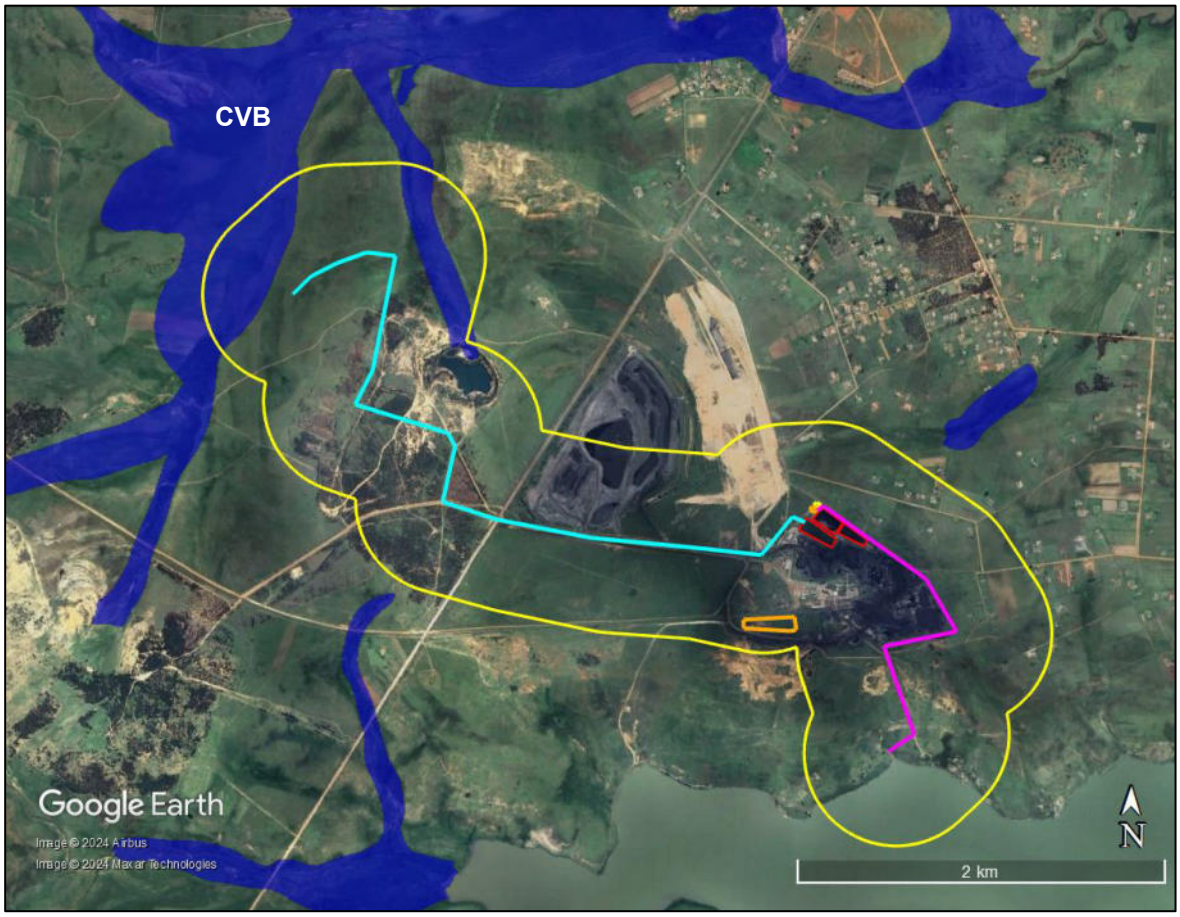
Figure 10-4: Location of the wetland features identified in the NFEPA Dataset (shown in green) in relation to a 500m radius (shown in yellow) of the project site

10.5 South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (2018)

A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018 (NBA 2018). The SAIIAE offers a collection of data layers pertaining to ecosystem types and pressures for both rivers and inland wetlands.

The SAIIAE builds on previous efforts while also introducing improvements and several new elements. An inventory of inland aquatic ecosystems responds to a multi-stakeholder need for the planning, conservation and management of these systems, as mandated by a number of Legislative Acts, including the South African National Water Act (NWA) and the National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act 10 of 2004) as amended.

The dataset has indicated the presence of one Channelled Valley Bottom wetland within a 500m radius of the project site. The location of the feature in relation to the project site is shown in Figure 10-5. It is important to note that no wetland features have been identified within the boundaries of the project site.

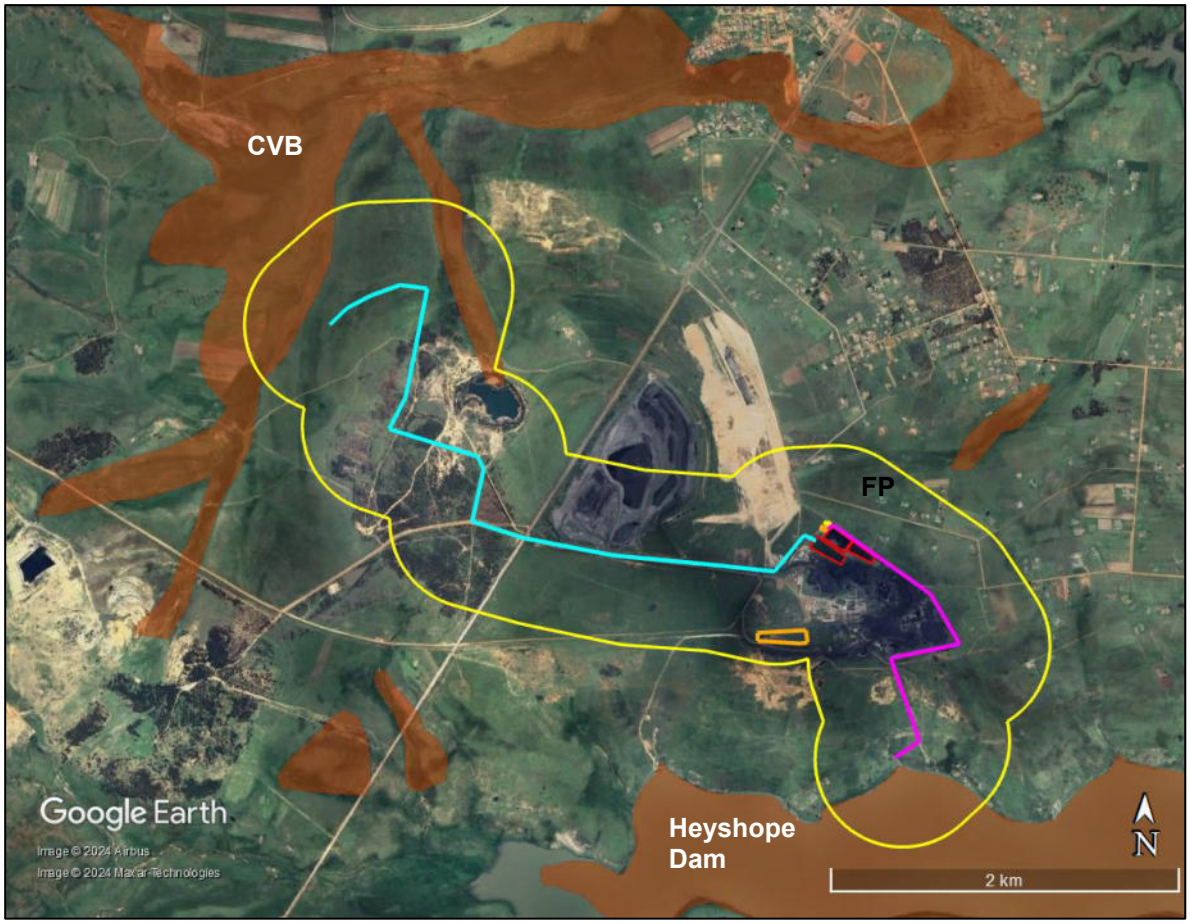


CVB = Channelled Valley Bottom

Figure 10-5: Location of the wetland feature identified in the SAIIAE Dataset (shown in blue) in relation to a 500m radius (shown in yellow) of the project site

10.6 Mpumalanga Highveld Wetland Study (2015)

The Mpumalanga Highveld Wetland (MPHG) Wetland map provides that spatial extent of the delineated wetland features in the Mpumalanga Province. This dataset has identified the presence of a single Channelled Valley Bottom wetland within a 500m radius of the project site. In addition, the dataset identifies the Heyshope Dam as an artificial wetland within the study site. The location of these features are shown in Figure 10-6.



CVB = Channelled Valley Bottom

Figure 10-6: Location of the wetland feature identified in the MPHG Wetland Dataset (2015), shown in orange, in relation to a 500m radius (shown in yellow) of the project site

11 FIELD ASSESSMENT FINDINGS

The findings presented in this section are based on the desktop assessment of the proposed project site.

11.1 Identification, delineation and mapping of aquatic features

The site assessment confirmed the absence of any natural wetland features within the boundaries of the project site. Furthermore, it identified three wetland features, one a Floodplain wetland (FP) associated with the Kwaggalaagte River, one a Channelled Valley Bottom wetland (CVB) associated with the Heilvleispruit and a Seep wetland (SP) within a 500m radius of the project site. The location of these features is indicated in Figure 11-1 and the identification of the wetland features is provided in Table 11-1.

Figure 11-1: Wetland classification as per SANBI guideline (Ollis *et al.* 2013)

Wetland System	Level 1	Level 2	Level 3	Level 4
	System	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)
HGM 1	Inland	Mesic Highveld Grassland Group 4	Slope	Channelled Valley Bottom wetland
HGM 2	Inland	Mesic Highveld Grassland Group 4	Slope	Channelled Valley Bottom wetland
HGM 3	Inland	Mesic Highveld Grassland Group 4	Slope	Channelled Valley Bottom wetland
HMG 4	Inland	Mesic Highveld Grassland Group 4	Gentle slope	Seep wetland
HGM 5	Inland	Mesic Highveld Grassland Group 4	Valley floor	Unchannelled valley bottom wetland
HMG 6	Inland	Mesic Highveld Grassland Group 4	Valley floor	Unchannelled valley bottom wetland
HMG 7	Inland	Mesic Highveld Grassland Group 4	Valley floor	Channelled Valley bottom

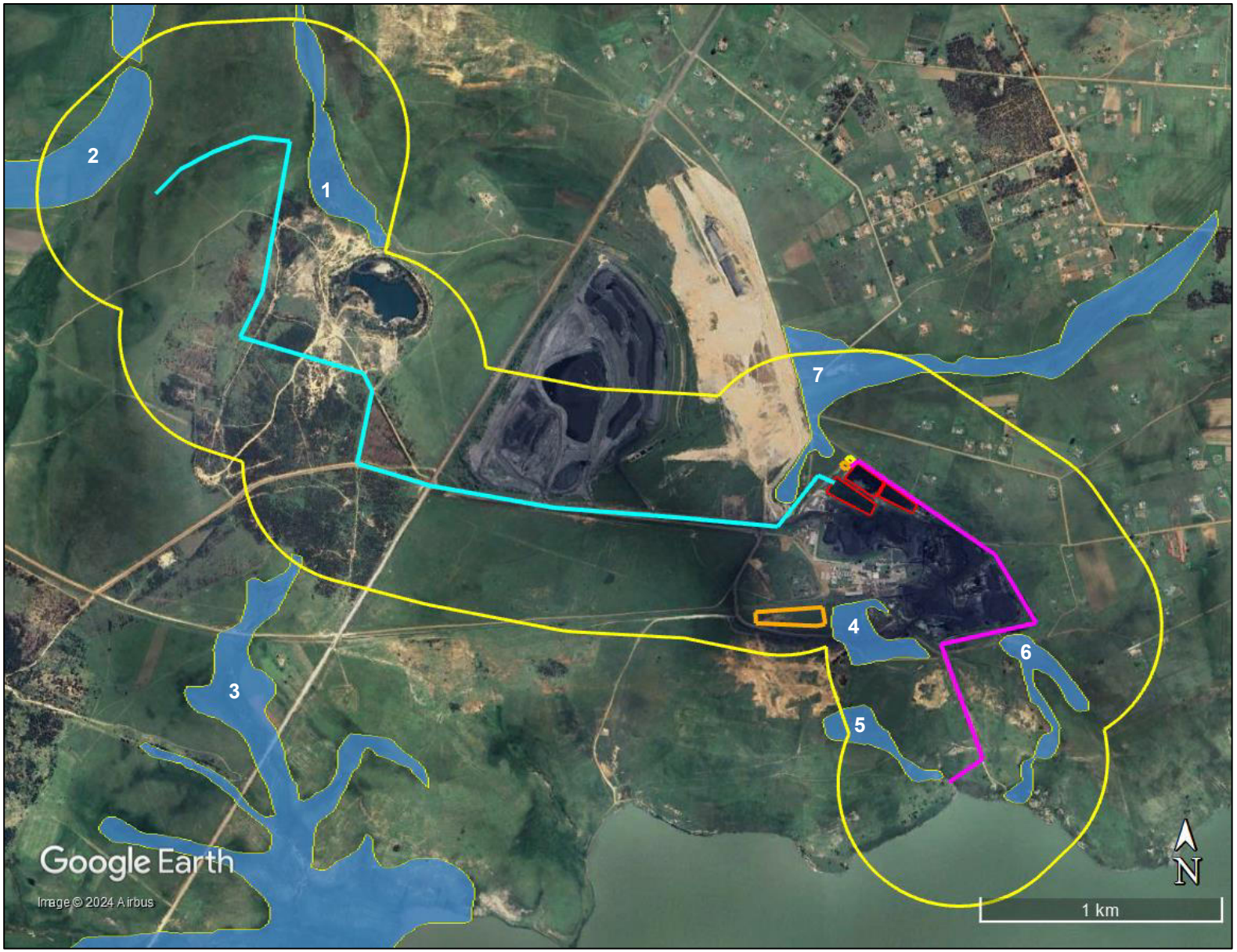


Figure 11-2: Location of the wetland features identified during the field assessment (in blue) within a 500m radius (in yellow) of the project site

11.2 Aquatic features functional assessment

The functional assessment of the wetland features all relates to the HGM Unit classification of the wetlands.

Seep wetlands are typically located on gentle slopes and contain no water inflow channels. Water will typically collect in these Seep areas and due to the dense vegetation within the footprint will have a relatively high roughness coefficient that slows the movement of water to a point that infiltration into the soils is a prominent feature of these wetlands. The key water inputs into these Seeps are the interflow from the near surface groundwater that moves down the slopes as well as overland surface flow down the slopes. Evaporation and channelled outflow are key water releases from the features.

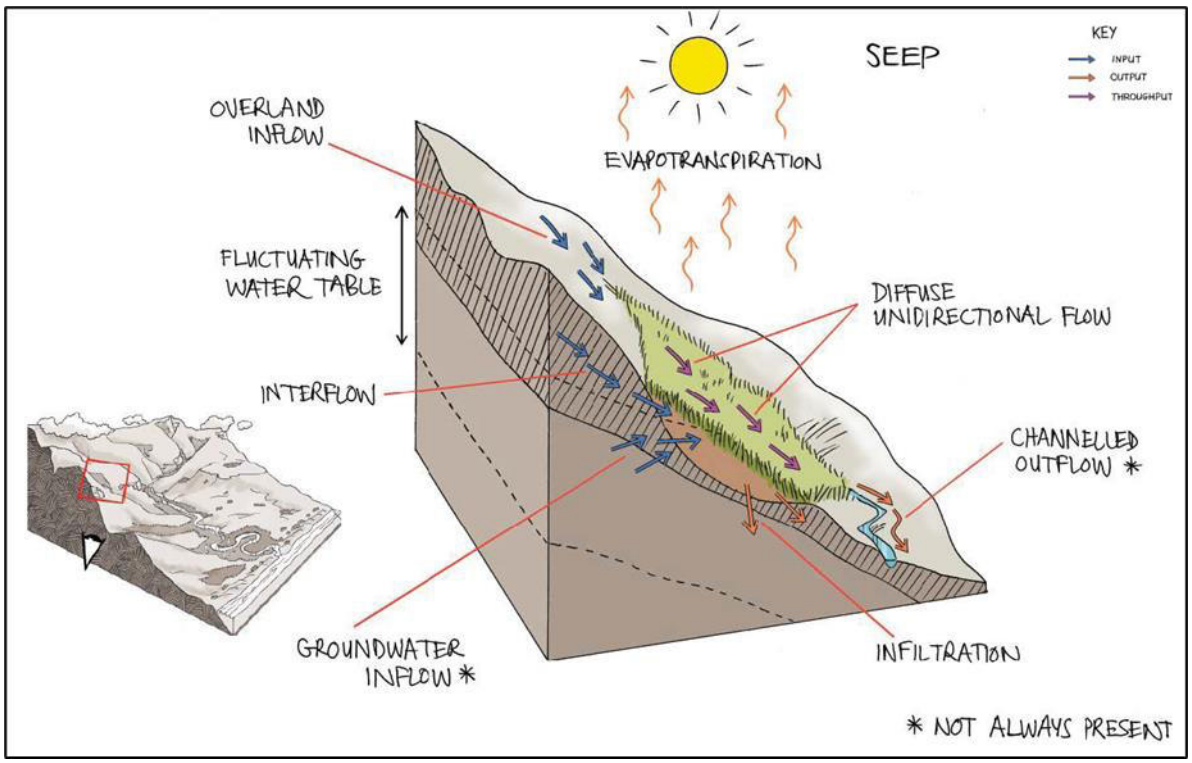


Figure 11-3*:* Conceptual illustration of a Seep wetland, showing the typical landscape setting and the dominant inputs, throughputs and outputs of water (Ollis *et al*. 2013)

Unchannelled Valley Bottom wetlands are characterised by their location on valley floors, an absence of a distinct channel and the presence of the diffuse flow of water through the feature. Water inputs are typically from an upstream channel that becomes dominated by diffuse (surface and subsurface) flow as it enters the wetland and seepage from adjacent slopes. There may also be groundwater input into the wetland. Water characteristically moves through the wetland in the form of diffuse surface or subsurface flow, but the outflow may be in the form of either diffuse or concentrated surface flow. As such, these wetland types provide services associated with the erosion control, storage of toxicants, phosphates and nitrates and certain level of flood retention.

Infiltration and evapotranspiration from unchanneled valley-bottom wetlands can be significant, but horizontal, unidirectional, diffuse surface flow tends to dominate these wetland systems.

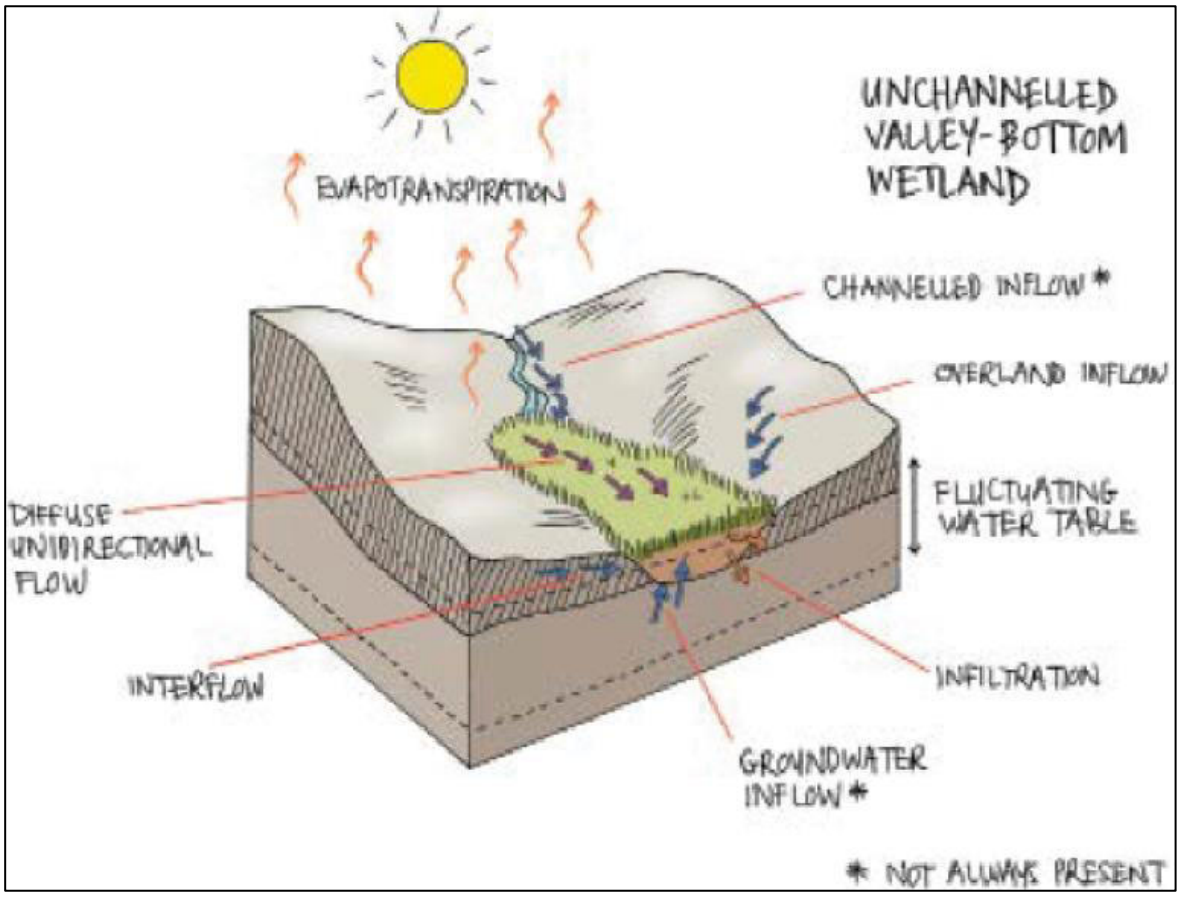


Figure 11-4: Conceptual illustration of a Unchannelled Valley Bottom wetland showing the typical landscape setting and the dominant inputs, throughputs and outputs of water (Ollis *et al*. 2013)

Channelled Valley Bottom wetlands must be considered as wetland ecosystems that are distinct from, but sometimes associated with, the adjacent river channel itself, which must be classified as a 'river'. These wetlands are characterised by their location on valley floors, the absence of characteristic floodplain features and the presence of a river channel flowing through the wetland.

Figure 11-5 is a conceptual diagram of a Channelled Valley Bottom wetland, showing the dominant inputs and outputs of water. Dominant water inputs to these wetlands are from the river channel flowing through the wetland, either as surface flow resulting from flooding or as sub- surface flow, and/or from adjacent valley-side slopes (as overland flow or interflow). Water generally moves through the wetland as diffuse surface flow, although occasional, short-lived concentrated flows are possible during flooding events

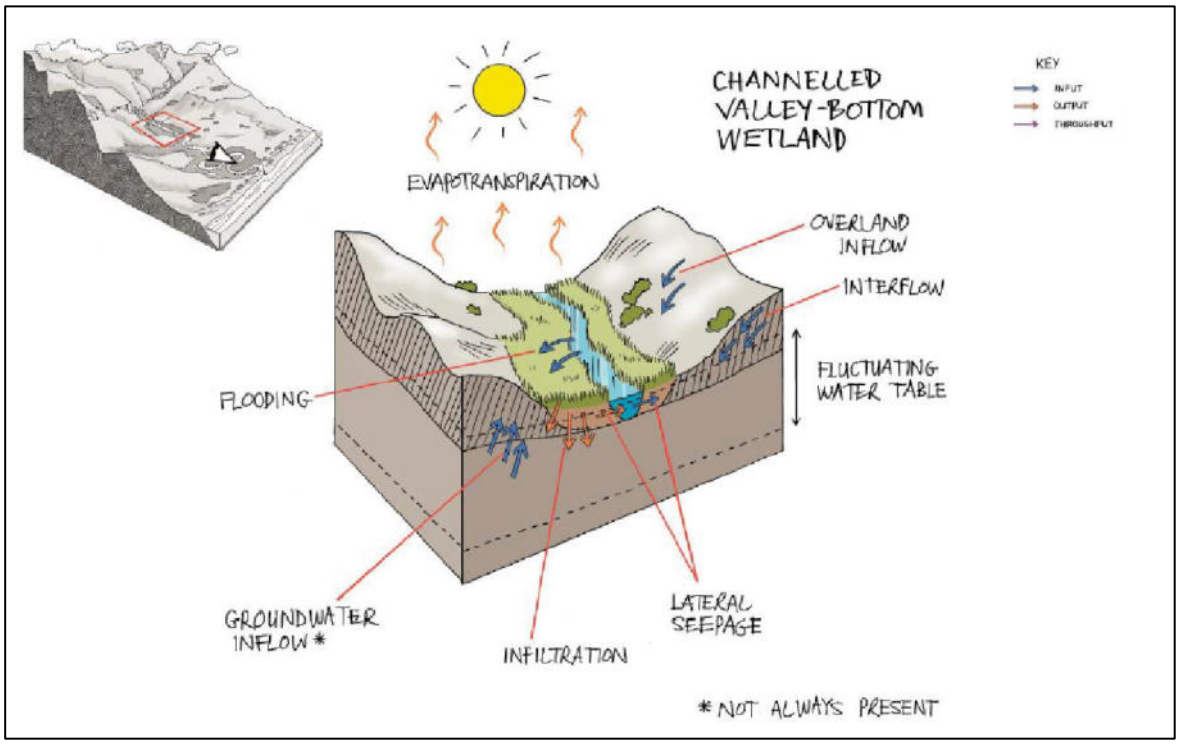


Figure 11-5*:* Conceptual illustration of a Channelled Valley Bottom wetland showing the typical landscape setting and the dominant inputs, throughputs and outputs of water (Ollis *et al*. 2013)

Water generally exits a Channelled Valley Bottom wetland in the form of diffuse surface or subsurface flow into the adjacent river, with infiltration into the ground and evapotranspiration of water from these wetlands also being potentially significant. Based on the hydrological characteristics of these wetlands they provide sediment, toxicant and nutrient storage functions as well as water supply particularly during the dry seasons.

The ecosystem services provided by the wetlands identified on site were assessed and rated using the WET-EcoServices method (Kotze *et al.* 2008). The summarised results for HGM 1 to HGM 7 are provided in Table 11-1. The average ecosystem services score has been determined to be “Moderately high”.

Table 11-1: Ecosystem service provision by the Channelled Valley Bottom Wetlands associated with the project site

Wetland Unit			HGM						
			1	2	3	4	5	6	7
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation		2.1	2.0	2.0	2.2	2.3	2.3	2.3
			Streamflow regulation		2.0	2.0	2.3	2.2	2.3	2.3	2.3
			Water enhancement benefits Quality	Sediment trapping	2.8	2.8	2.8	2.9	2.8	2.8	2.8
				Phosphate assimilation	2.4	2.2	1.9	2.2	2.4	2.2	1.9
				Nitrate assimilation	1.9	1.9	1.5	2.4	2.2	2.2	2.2
				Toxicant assimilation	2.4	2.4	1.9	2.6	2.4	2.4	2.4
				Erosion control	2.3	2.0	1.7	1.8	1.8	1.8	1.7

			Carbon storage	1.7	1.7	1.3	1.3	2.0	2.0	1.7
	Direct Benefits	**Biodiversity maintenance**		1.4	1.4	1.8	1.6	1.8	1.6	1.6
		Provisioning benefits	Provisioning of water for human use	2.2	1.7	1.7	1.7	1.7	1.7	1.7
			Provisioning of harvestable resources	2.8	2.2	2.2	2.2	2.2	2.2	2.2
			Provisioning of cultivated foods	1.8	1.8	1.8	1.8	1.8	1.8	1.8
		Cultural benefits	Cultural heritage	1.3	1.3	1.3	1.3	1.3	1.3	1.3
			Tourism and recreation	1.7	1.7	1.7	1.7	1.9	1.7	1.7
			Education and research	1.0	1.0	1.0	0.8	1.8	0.8	1.0
Average Eco Services Score				2.0	3.0	2.0	2.0	2.0	2.0	2.0

The key ecosystem services provided by the wetland features relate directly their ability to assimilate various substances that move through the catchment. These include nitrates, phosphates and toxicants while the wetlands trap sediment from the catchment which allows for the establishment of dense wetland vegetation that in turn limits the erosion in the features.

11.3 Determining the Present Ecological State of an aquatic feature

The PES of an aquatic feature is a function of the impacts that are present within the footprint of the feature as well as the catchments associated with each of these features and how these impacts affect the drivers of the wetland and watercourse.

The impacts identified in the table above were used in the Level 1 WET-Health assessment to determine the PES of the wetland system. The results of the Level 1 assessment are provided in the table below.

Table 11-2: Present Ecological State (PES) of the system

HGM Unit	Driver			Combined score
	Hydrology	Geomorphology	Vegetation	
1	4.1	6.2	4.6	**4.8 = Class D Largely modified**
2	4.5	6.8	4.8	**5.2 = Class D Largely modified**
3	4.7	7.3	5.3	**5.6 = Class D Largely modified**
4	2.3	1.2	2.6	**2.0 = Class C Moderately modified**
5	2.2	1.1	1.7	**1.7 = Class B Small modification**
6	2.6	1.4	2.6	**2.3 = Class C Moderately modified**
7	4.4	4.6	5.2	**4.7 = Class D Largely modified**

The wetland classification provided above makes provision for the following:

- The Class B wetland is considered to be largely natural with limited impacts on the wetland drivers resulting in very little impact on the wetland biodiversity and function.
- The Class C wetlands are considered to have moderate modifications of its wetland drivers resulting in limited impact to the wetland biodiversity and function.
- The Class D wetlands are considered to have undergone large modifications due to severe impacts resulting in large changes to the wetland drivers which consequently results in significant impacts on the wetland biodiversity and function.

11.4 Determining the Ecological Importance and Sensitivity of aquatic features

The Ecological Importance of any aquatic feature is an expression of its importance to the maintenance of the ecological diversity and functioning within itself, as well as hydrologically downstream. The Ecological Sensitivity is a function of the system's ability to resist disturbances on its drivers and its capability to recover from these disturbances once they have occurred.

The wetland EIS assessment was applied to the HGM units described in the previous section to assess the levels of sensitivity and ecological importance of the wetlands. The result of the assessment is shown in Table 11-3.

Table 11-3: Ecological importance and sensitivity of the aquatic system

HGM Unit	Criteria	Importance	EIS Class	Overall importance and sensitivity
1	Ecological importance and sensitivity	2.7	M	Medium
	Hydrological/functional importance	2.8	M	
	Direct human benefits	1.3	L	
2	Ecological importance and sensitivity	2.7	M	Medium
	Hydrological/functional importance	2.8	M	
	Direct human benefit	1.3	L	
3	Ecological importance and sensitivity	2.4	M	Medium
	Hydrological/functional importance	2.7	M	
	Direct human benefits	1.9	L	
4	Ecological importance and sensitivity	3.7	H	Medium
	Hydrological/functional importance	2.8	M	
	Direct human benefits	1.0	L	
5	Ecological importance and sensitivity	3.3	H	High
	Hydrological/functional importance	3.0	H	
	Direct human benefits	1.7	L	
6	Ecological importance and sensitivity	2.2	M	Medium
	Hydrological/functional importance	2.2	M	
	Direct human benefits	1.7	L	
7	Ecological importance and sensitivity	2.2	M	Medium
	Hydrological/functional importance	2.2	M	
	Direct human benefits	1.7	L	

11.5 Buffer determination

The modelled wetland characteristics was used to determine the appropriate buffer for these wetlands by using the wetland buffer determination model developed by the Water Research Commission.

Based on the findings of the assessment, the location and extent of the aquatic features, the PES of the aquatic features, the ecosystem services provided by the system and the EIS of the aquatic features, the following buffers have been determined:

Construction Phase:

- No plant and equipment must be allowed to be parked within a 40m distance of the delineated edge of any delineated wetland;
- No portable ablution facilities must be allowed to be placed within a 40m distance of the delineated edge of any wetland; and
- No petrochemical storage facilities must be allowed to be placed within a 40m distance of the delineated edge of any wetland.

Operational Phase:

- No part of the infrastructure associated with the project must be allowed to be within a 20m distance from the delineated edge of any wetland.

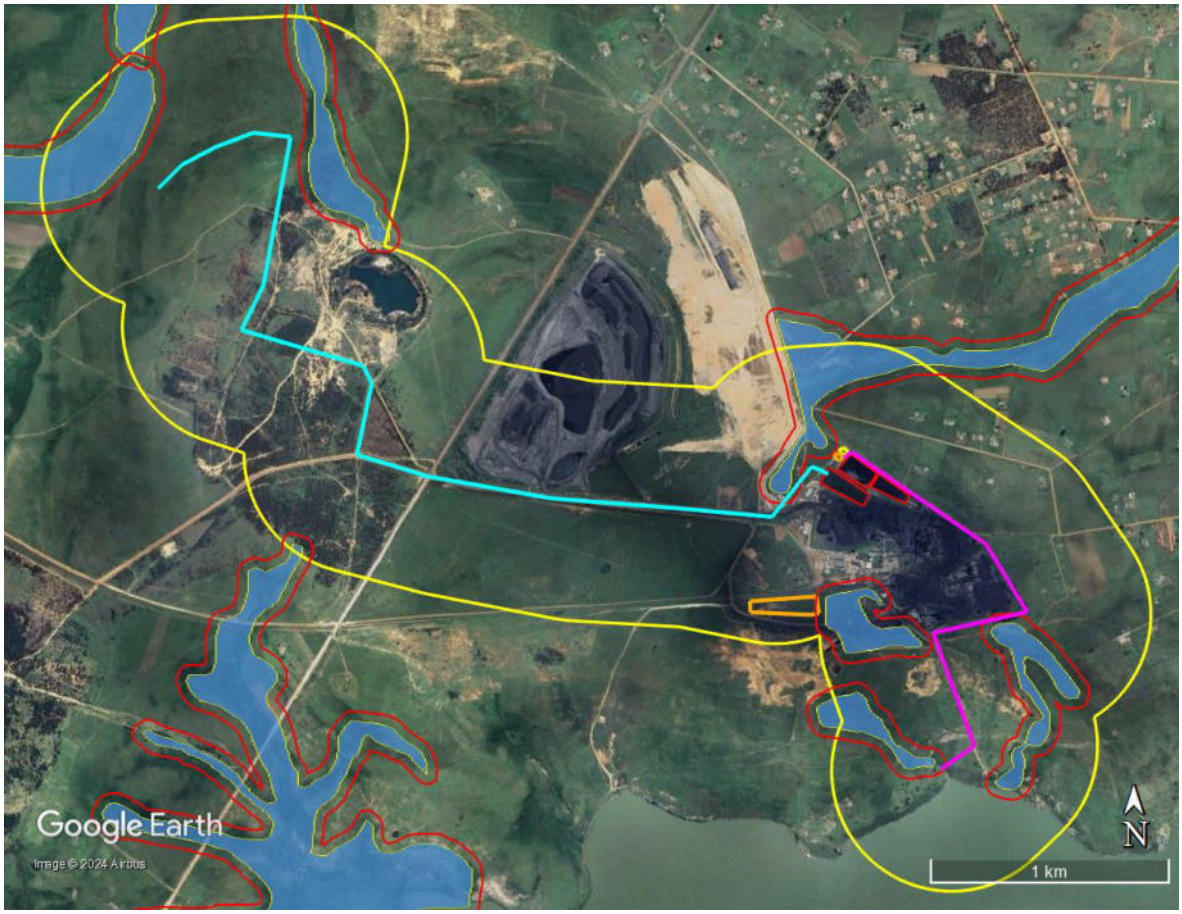


Figure 11-6: Location and extent of the applicable 40m construction buffer (in red) around the wetland within the study site

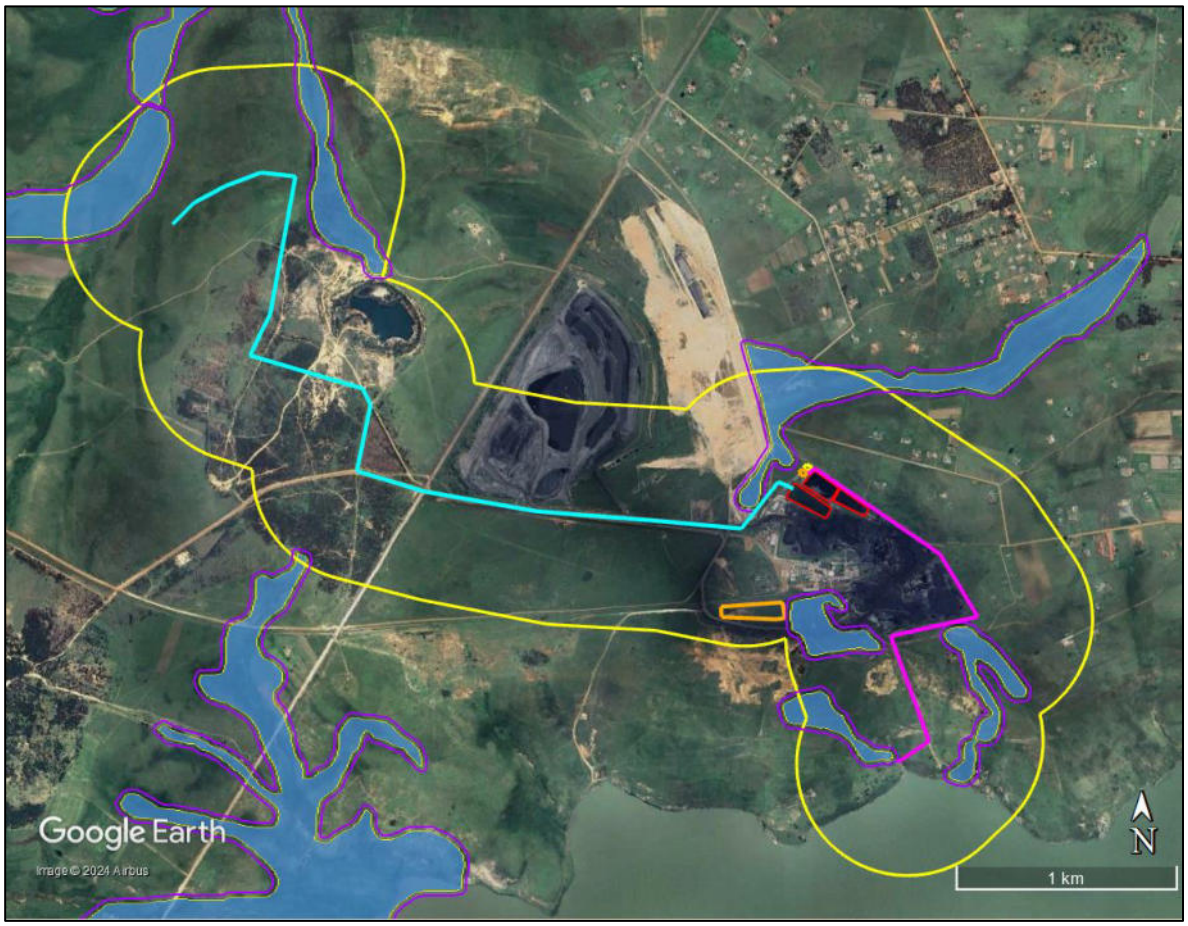


Figure 11-7: Location and extent of the applicable 20m operational buffer (in purple) around the wetland features within the study site

12 IMPACT ASSESSMENT

Likely impacts associated with the proposed establishment and operation of the project infrastructure on the project site on the identified aquatic features have been identified through the undertaking of site visits, consultation of published information and independent assessment by the Environmental Project Team. Impacts have also been identified by the specialist assessments undertaken. The impact assessment methodology is provided in Appendix B.

The impacts assessed for the construction and operational phases of the project are provided in Table 12-1 and Table 12-2. Please note that no provision is made for the decommissioning phase of the project as it will not be decommissioned within the next 10 years and as such the determined aquatic baseline might change over time.

Table 12-1: Construction phase impacts associated with the Maquasa Mine project

Nature of impact	Impact summary	Without mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (pre-mitigation)	Proposed mitigation and management measures	With mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (post-mitigation)
		S*	E	D	M	P			S	E	D	M	P	
Loss of riparian vegetation	Potential loss of riparian vegetation as a result of the earthworks associated with the construction activities.	-	2	2	6	3	**Score: 30 Medium Negative**	The implementation of the proposed 40m buffer around the delineated edges of the wetlands that have been assessed will ensure that no riparian vegetation will be lost during the construction phase. To ensure that the integrity of the buffer is kept the buffer must be clearly demarcated for the duration of the construction phase.	-	1	2	2	1	**Score: 5 Low Negative**
Potential increase in sedimentation of the wetland features.	The construction will require the clearance of vegetation from the construction site. Uncontrolled stormwater management of the cleared construction areas could result in increased sedimentation of the wetlands.	-	2	2	6	3	**Score: 30 Medium Negative**	A Stormwater Management Plan for the construction phase of the project must be compiled that makes provision for the following: • All areas that are to be cleared for the construction activities must be clearly demarcated before clearance. This is to ensure that the cleared areas are limited to the construction footprint only. • Provision must be made for the capturing of any silt that may wash of the cleared areas. • No stormwater discharge will be allowed to be made directly in any wetland feature from the construction footprint. • If the construction schedule allows, construction should take	-	1	2	2	2	**Score: 10 Low Negative**

Nature of impact	Impact summary	Without mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (pre-mitigation)	Proposed mitigation and management measures	With mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (post-mitigation)
		S*	E	D	M	P			S	E	D	M	P	
								place during the dry season to limit the potential impact.						
Contamination of the area by petrochemical spillages	The presence of plant and equipment on the construction site that make use of petrochemical substances for operation pose a risk of contamination of the water quality in the wetlands.	-	2	3	6	3	**Score: 33 Medium Negative**	The following management and mitigation measures must be included into the Environmental Management Programme for the project: • All plant and equipment that make use of petrochemical substances must be checked leakages on a daily basis before operations commence. • All plant and equipment that are found to be leaking must be removed from the property and only returned once the leakages have been addressed. • If any petrochemical substances are stored on the property, this storage must be done on an impermeable surface in a bunded area that makes provision for 110% of volume of the substances that are stored. • All refuelling of plant and equipment must be conducted over a drip-tray and will not be allowed to take place within the	-	1	1	6	2	**Score: 18 Low Negative**

Nature of impact	Impact summary	Without mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (pre-mitigation)	Proposed mitigation and management measures	With mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (post-mitigation)
		S*	E	D	M	P			S	E	D	M	P	
								40m wetland buffer proposed for the construction phase. • If any plant or equipment is to be parked on the site, these must be parked outside of the 40m wetland buffer proposed for the construction phase • If any spillages from plant or equipment occur, the spill must be immediately contained, the contaminated soils must be collected and bagged in impermeable bags and stored on site to be removed and disposed of by a registered service provider.						
Contamination of the aquatic features by the on-site ablution facilities.	Spillage or leakage could impact on the water quality that moves through the aquatic features, which could decrease the PES of the features.	-	1	1	6	4	**Score: 32 Medium Negative**	The following management measures associated with the ablution facilities must be implemented: • All portable ablution facilities that will be used on site must be located 40m away from the edge of the delineated aquatic feature. If the edge is not clearly defined, this must be done by an aquatic specialist before implementation of the ablutions can take place. • The portable ablution facilities must be provided with sealed wells in which the sewage is collected.	-	1	1	2	2	**Score: 8 Low Negative**

Nature of impact	Impact summary	Without mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (pre-mitigation)	Proposed mitigation and management measures	With mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (post-mitigation)
		S*	E	D	M	P			S	E	D	M	P	
								• The servicing of these portable ablution facilities must be conducted by a registered service provider who must dispose of the material at a Municipal facility. • A Spill Contingency Plan must be put in place to provide the appropriate management and mitigation measures to be implemented in the event of any spillages from these ablution facilities.						

Table 12-2: Operational phase impacts associated with the Maquasa Mine project

Nature of impact	Impact summary	Without mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (pre-mitigation)	Proposed mitigation and management measures	With mitigation S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					Significance rating (post-mitigation)
		S*	E	D	M	P			S	E	D	M	P	
Contamination of leakage of untreated effluent from the WWTW	Any leakages of untreated effluent from the WWTW will result in the contamination of the water in the wetland features which will impact on the PES of the features.	-	2	2	8	3	**Score: 36 Medium Negative**	The Operational Management Plan of the WWTW must make provision for regular monitoring of the works to ensure that there are no leakages from the plant. The design of the WWTW must make provision for the discharge of any overflow effluent into the associated PCDs to ensure that the no untreated effluent is released from the works area.	-	1	2	8	1	**Score: 11 Low Negative**

Nature of impact	Impact summary	Without mitigation					Significance rating (pre-mitigation)	Proposed mitigation and management measures	With mitigation					Significance rating (post-mitigation)
		S*	E	D	M	P			S	E	D	M	P	
		S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability							S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					
								No untreated effluent will be allowed to be discharge from the WWTW. The Operational Management Plan should also make provision for the actions that must be taken in the event of an accidental spill form the works area. These should make provision for: • Containment of the leakage; • Collection of the effluent and possible contaminated soils; • Storage of the contained material; and • Removal and disposal from the site by registered service provider.						
Contamination of leakages of untreated effluent from the pipeline network.	Any leakages of untreated effluent from the pipe networks supplying untreated effluent to the WWTW will result in the contamination of the water in the wetland features which will impact on the PES of the features.	-	2	2	8	3	**Score: 36 Medium Negative**	The Operational Management Plan of the WWTW must make provision for regular monitoring of the pipework that deliver effluent to ensure that there are no leakages from the pipelines. The Operational Management Plan should also make provision for the actions that must be taken in the event of an accidental spill form the pipelines. These should make provision for: • Containment of the leakage; • Collection of the effluent and possible contaminated soils; • Storage of the contained material; and • Removal and disposal from the site by registered service provider.	-	1	2	8	2	**Score: 11 Low Negative**

Nature of impact	Impact summary	Without mitigation					Significance rating (pre-mitigation)	Proposed mitigation and management measures	With mitigation					Significance rating (post-mitigation)
		S*	E	D	M	P			S	E	D	M	P	
		S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability							S = Status; E = Spatial extent; D = Duration; M = Magnitude P = Probability					
Changes to the hydrological regime of the wetlands due to leakages from the treated discharge pipeline.	Any leakages of treated effluent from the discharge pipeline may result in additional water entering the wetland features associated with the project. This additional water moving into the wetlands may impact the PES of the features.	-	2	2	4	3	**Score: 24 Medium Negative**	The Operational Management Plan of the WWTW must make provision for regular monitoring of the treated effluent discharge pipeline for any leakages. The Operational Management Plan should also make provision for the actions that must be taken in the event of any leakages from the pipeline. These should make provision for: • Stopping the treated effluent discharge; and • Immediately addressing the leak from the pipeline.	-	2	2	4	1	**Score: 8 Low Negative**
Pollution of the Heyshope Dam due to treated effluent discharge limits not being met by the WWTW.	The discharge of treated effluent is directly into the Heyshope Dam. Any changes in the quality of the treated effluent may impact on the water quality in the dam.	-	2	3	8	3	**Score: 39 Medium Negative**	The Operational Management Plan of the WWTW must make provision for regular treated effluent quality monitoring to take place to ensure that the treated effluent remains in the discharge limits that will be stipulated in the Water Use Licence for the discharge. If the discharge limits cannot be met, the discharge should be ceased up until such time as the limits associated with the licence can be produced.	-	2	2	4	1	**Score: 8 Low Negative**

13 MANAGEMENT AND MITIGATION MEASURES

The management and mitigation measures as they relate to the impacts associated with the aquatic features are provided in Table 12-1 and Table 12-2. These measures must be included in the Environmental Management Programme Report and Operational Management Plant for the construction and operational phases of the project.

14 MONITORING REQUIREMENTS

It is recommended that an Environmental Control Officer, who meets the requirements of the NEMA: EIA Regulations (2014) as amended, be appointed to conduct monthly audits of the construction phase of the project. An audit report must be completed for each monthly audit and be submitted to the relevant authority.

In addition, it is suggested that provision be made for a biannual biomonitoring be conducted of the identified wetland features and that monthly water quality monitoring be done on the treated effluent discharge at the point of discharge into the Heyshope Dam. This will ensure early detection of any exceedances of the discharged limits.

15 CONCLUSION AND SPECIALIST REASONED OPINION

Appendix 6 of the National Environmental Management Act (Act 107 of 1998): Environmental Impact Assessment Regulations (2014), as amended requires that the specialist conducting a specialist study for submission with an Application for Environmental Authorisation provide a reasoned opinion on whether an authorisation should be granted. In this regard, the following key findings were considered:

- Wetland systems were identified within the study area.
- A total of seven wetland systems were identified within the “regulated area of a watercourse” as defined by the National Water Act (Act No. 36 of 1998).
- The PES of these wetlands ranged from Class B (one wetland), Class C (two wetlands and Class D (four wetlands) with the EIS of the features being classified as low to medium.
- The impacts that were identified and assessed can all be sufficiently managed and mitigated by the implementation of the measures detailed in this assessment.

Based on this, it is the opinion of the specialist that there are no fatal flaws that will prevent the development from being authorized subject to the implementation of the mitigation measures provided in this report.

It is also suggested by the specialist that a rehabilitation plan must be implemented during the rehabilitation of the mine. The rehabilitation plan must focus on the following aspects:

- Rehabilitation of head-cuts where they occur within the identified wetland features.
- Rehabilitation of overgrazed riparian and surrounding areas.

16 REFERENCES

Department of Water and Sanitation Report – Wetland and riparian habitat delineation document;

Department of Water and Sanitation Report – Risk Assessment Protocol and associated Matrix;

MUCINA, L. and RUTHERFORD, M.C. (eds.), 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia Publishers.

South African National Biodiversity Institute – Wetland buffer guideline document;

South African National Biodiversity Institute – Classification System for Wetlands and other Aquatic Ecosystems in South Africa (Ollis. et al.)

Water Research Commission Report TT659/16 – High Risk Wetland Atlas;

Water Research Commission Report TT339/08 – WET-EcoServices a technique for rapidly assessing ecosystem services supplied by wetlands; and

Water Research Commission Report TT340/08 – WET-Health a technique for rapidly assessing wetland health.

APPENDIX A
SPECIALIST CURRICULUM VITAE

Magnus van Rooyen

Technical Director - Environment

CORE SKILLS

- Environmental Impact Assessment
- Specialist Ecological (Terrestrial and Aquatic) Assessment
- Environmental Screening Assessment
- Due Diligence Assessment and Feasibility Studies
- Mining Applications
- Environmental Management Programmes and Plans
- Strategic Environmental Assessments
- Wildlife Management Plans

DETAILS

Qualifications

- MPil. Environmental Management
- BSc (Hon) Botany
- BSc (Botany and Zoology)
- Post Graduate Certificate in Education (Science and Biology)

Memberships

- South African Council for Natural Scientific Professions (Pr. Sci. Nat. 400335/11)
- International Association of Impact Assessors (Ref No. 1839)

Languages

- Afrikaans - fluent
- English - fluent
- German - fair
- Zulu - communication

Countries worked in:

South Africa, Namibia, Lesotho, Mozambique, Botswana, Guinea, Liberia, United States, United Kingdom

PROFILE

Mr van Rooyen is currently a Technical Director – Environment and the Branch Manager of the KwaZulu-Natal Office of GCS in Durban.

In addition to holding a Masters degree in Environmental Management, he also holds a BSc degree in Botany and Zoology, an Honors degree in Botany and a Post Graduate Certificate in Education. He has in excess of 18 years' experience in the environmental consulting field through conducting and managing Environmental Impact Assessments, Specialist Terrestrial and Aquatic Ecology Assessments and Strategic Environmental Management inputs into various project feasibility studies.

Through these services, he has been exposed to projects in a range of sectors which include the general public infrastructure sector (national and provincial roads, harbour and rail developments, water (dams and supply) and wastewater (treatment works and reticulation), private infrastructure sector (small and large scale housing developments, lodges, private dams, etc.), agricultural sector (dams, establishment of orchards, plantations and feedlots), mining sector (coal mines, gold mine, manganese mines, aggregates and associated mining infrastructure) and the industrial sector (light and heavy industrial infrastructure development).

In addition, Mr van Rooyen has extensive experience in conducting specialist terrestrial and aquatic ecological assessments for various infrastructure (roads, dams, ports) and industrial (smelters, power plants) development projects in a number of diverse ecosystems across Africa. He has experience in the compilation of Resettlement Policy Framework Plans, Due Diligence Assessments and Feasibility Studies associated with infrastructure development projects. Mr van Rooyen has experience in working on various private and public sectors as well as rural and urban environments in various countries

Previous Experience

Client	Project Description	Role/ Responsibility
Private client	**Wetland Assessment for the farm dam on the Farm Compentation near Matatiele** Undertaking of the wetland assessment for the development of an irrigation dam on the Farm Compensation near Matatiele in KwaZulu-Natal.	Wetland Specialist
Senekal Boerdery	**Wetland and Biodiversity Assessment for the Mkuze Township Establsishment** Undertaking of the wetland and biodiversity assessment associated with the township establishment in the town of Mkuze, KwaZulu-Natal.	Wetland and Biodiversity Specialist
WSP Consulting	**Wetland Assessment associated with the establishment of a flood protection berm at the SAPPI Saiccor Mill** Undertaking of the wetland assessment for the construciton of a flood protection berm between the uMkomaas River and the SAPPI Saiccor Mill in KwaZulu-Natal.	Wetland Specialist
Transnet National Ports Authority	**Forest mapping within the Port of Richards Bay** Undertaking of the mapping and classification of all the indigenous forest areas withini the Port of Richards Bay, KwaZulu-Natal.	Biodiverstiy Specialist
RHDHV	**KwaMathanya Water Supply Scheme Wetland Assessment** Undertaking of the wetland assessment of the KwaMathanya water supply scheme near town of Ixopo in KwaZulu-Natal.	Wetland Specialist
Private client	**Brownsdrift Hydropedological Assessment** Undertaking of the wetland and hydropedological assessment associated with the proposed residential developmnet on the site in Browndrift, eThekwini Municipality, KwaZulu-Natal.	Wetland Specialist
GreenScene Environmental	**Wetland and Biodiversity Assessment for a residential property in Pumula** Undertaking of the wetland and biodiversity assessment for the residential development on Lot 967 Pumula, KwaZulu-Natal.	Wetland and Biodiversity Specialist
GreenScene Environmental	**Wetland and Biodiversity Assessment for Lot 962 and 965 Port Edward** Undertaking of the wetland and biodiversity assessment for the residential development on Lot 962 and 965 Port Edward, KwaZulu-Natal.	Wetland and Biodiversity Specialist
Msunduzi Municipality	**Wetland and Biodiversity Assessment for various Military Veterans Housing sites within the Msuduzi Municipality** Undertaking of the wetland and biodiversity assessment for the various sites earmarked for the establishment of residential houses for the Military Veterans in the Msunduzi Municipality, KwaZulu-Natal.	Wetland and Biodiversity Specialist
Private client	**Forest delineation of a private property in Munster** Undertaking of the delineation of the forest margins on the residential property in Munster, KwaZulu-Natal.	Biodiverstiy Specialist

Previous Experience

Client	Project Description	Role/ Responsibility
JG Afrika (Pty) Ltd	**Gunyana Water Supply Scheme Wetland and Biodiviersity Assessment** Undertaking of the wetland and biodiverstiy assessment of the Gunyana community water supply scheme near town of Pomeroy in KwaZulu-Natal.	Wetland and Biodiversity Specialist
GreenScene Environmental	**Wetland and Vegetation Assessment associated with the construction of the Ingwebaba Pedestrian Bridge near Shelly Beach** Undertaking of the wetland and vegetaiton assessment for the construction of the Ingwebaba Pedestrian Bridge near Shelly Beach in KwaZulu-Natal.	Wetland and Biodiversity Specialist
Terratest (Pty) Ltd	**Wetland and Vegetation Assessment associated with the construction of the KwaHlokohloko Rural Water Supply Scheme near Eshowe** Undertaking of the wetland and biodiverstiy assessment of the KwaHlokoloko community water supply scheme near town of Eshowe in KwaZulu-Natal.	Wetland and Biodiversity Specialist
Coastal Macadamias	**Wetland Assessment associated with the development of an irrigation dam for Coastal Macadamias near Ramsgate** Undertaking of the wetland assessment for the development of an irrigation dam for the Coastal Macadamias property near Ramsgate, KwaZulu-Natal.	Wetland Specialist
South African National Roads Agency Limited	**Ballito to Tinley Manor Wetland and Biodiveristy Assessment** Undertaking of the wetland and biodiversity study to support the preliminary design for the upgrade of the N3 between Ballito and Tinley Manor.	Wetland and Biodiversity Specialist
Vale Limitada	**Biodiversity Assessment for the alternative water supply pipeline** Undertaking of the biodiversity assessment to suport the preliminary design of the proposed alternative water supply pipeline at the Moatize Mine in Tete, Mozambique.	Biodiversity Specialist
GIB Consulting Engineers	**Aquadene Wetland Assessment** Undertaking of the wetland assessment for the Aquadene housing development in Richards Bay.	Wetland Specialist
JG Afrika (Pty) Ltd	**Wetland Assessment for the pipeline route for the drought relief pipeline in Laingsburg** Undertakaing of the wetland assessment assocaited with the 25km pipeline route from the watersource to the town of Laingsburg in the Western Cape.	Wetland Specialist
Seche International	**Wetland and Biodiversity Assessment for the proposed new uMgungundlovu Landfill Site** Preliminary wetland and biodiversity assessment for the proposed new uMgungundlovu Landfill site outside of Pietermaritzburgg.	Wetland and Biodiversity Specialist
South African National Roads Agency Limited	**Wetland and Vegetation Assessment associated with the upgrading of the N1 between Heuningspruit and Koppies** Undertaking of the wetland and biodiversity assessment for the upgrading of the N1 between Heuningspruit and Koppies in the Freestate Province.	Wetland and Biodiversity Specialist

Previous Experience

Client	Project Description	Role/ Responsibility
Terratest (Pty) Ltd	**Wetland and Vegetation Assessment associated with the upgrading of the Nelson Mandelar Museum at Qunun** Undertaking of the wetland and vegetation assessment associated with the upgrading of the Nelson Mandela Museum in Qunu in the Eastern Cape Province.	Wetland and Biodiversity Specialist
GreenScene Environmental	**Wetland and Vegetation Assessment associated with the construction of the Ulundi Water Supply Scheme** Undertaking of the wetland and biodiverstiy assessment of the Ulundi water supply scheme near town of Eshowe in KwaZulu-Natal.	Wetland and Biodiversity Specialist
MOZAL	**Biodiversity Assessment for the raw water supply pipeline for the Mozal Aluminium Smelter in Mozambique** Undertkaing of the biodiversity assessment for the raw water supply pipeline from the desalination plant in the Port of Matola to the MOZAL smelter int Boane, Maputo, Mozambique.	Biodiversity Specialist
JG Afrika (Pty) Ltd	**Wetland and Biodiveristy Assessment for various water supply schemes in the Cedarberg Municpality** Undertaking of the wetland and biodiversity assessments for the water supplys schemes for the town of Whupperthal, Clanwilliam and Citrusdal in the Western Cape.	Biodiversity Specialist
uKhozi Environmentalists	**Phalanndwa Coal Mine Biodiversity and Wetland Assessment** Undertaking the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the Phalanndwa Coal Mine Expansion near Delmas.	Wetland and Biodiversity Specialist
Kongiwe Environmental Consultants	**Lephalale Coal Mine Biodiversity and Wetland Assessment** Undertaking the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the Lephalale Coal Mine near Lephalale.	Wetland and Biodiversity Specialist
Nzingwe Consultancy	**Riversdale Coal Mine Wetland Assessment** Undertaking the wetland specialist study in support of the Application for Environmental Authorisation and the Water Use Licence Application for the Riversdale Coal Mine near Vryheid.	Wetland Specialist
WSP Environmental	**SAPPI Saiccor Wetland Assessment** Undertaking the wetland specialist study in support of the Application for Environmental Authorisation for the construction of flood protection	Wetland Specialist

Client	Project Description	Role/ Responsibility
	measures associated with the SAPPI Saiccor Mill, uMkomaas.	
WSP Environmental	**11th Avenue Interchange Wetland Assessment** Undertaking the wetland specialist study in support of the Application for Environmental Authorisation for the construction of the 11th Avenue Interchange, Durban	Wetland Specialist
WSP Environmental	**SAPPI Saiccor Alien Invasive Plant – Risk Assessment** Undertaking of the risk assessment of the presence of various listed category I and II alien invasive plant species on the SAPPI Saiccor Mill site, uMkomaas.	Vegetation Specialist
Environmental Resources Management	**Bhangazi Community Tented Camp Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the establishment of the Bhangazi Community Tented Camp in the isiMangoliso Wetland Park, St. Lucia.	Wetland and Biodiversity Specialist
South African National Roads Agency Limited	**N3 – Market Road Interchange Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the upgrading of the N3 – Market Road Interchange, Pietermaritzburg.	Wetland and Biodiversity Specialist
ESKOM SOC	**ESKOM 22 kVA Lines Vegetation Assessments** Undertaking of vegetation assessments for the establishment of various 22kVA electrification lines in KwaZulu-Natal.	Vegetation Specialist
ESKOM SOC	**Tombo to Mafini 300kVA Line Vegetation Assessments** Undertaking of vegetation assessment for the route alignment of the 300kVA high voltage electricity line from the Tombo Substation to Mafini, Port St. Johns.	Vegetation Specialist
Element Consulting Engineers	**Port St. Johns Water Treatment Works Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the establishment of the Port St. Johns Water Treatment Works, Port St. Johns.	Wetland and Biodiversity Specialist
South African National Roads Agency Limited	**N2 – uMgeni Road Interchange Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the upgrading of the	Wetland and Biodiversity Specialist

Client	Project Description	Role/ Responsibility
	N2 – uMgeni Road Interchange, Durban.	
South African National Roads Agency Limited	**N2 – Mt Edgecombe Interchange Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the upgrading of the N2 – Mt Edgecombe Interchange, Durban.	Wetland and Biodiversity Specialist
Afrimat	**Ladysmith Quarry Wetland and Biodiversity Assessment** Undertaking the wetland and biodiversity specialist study in support of the Mining Right Application for the establishment of the Afrimat Quarry, Ladysmith.	Wetland and Biodiversity Specialist
South African National Roads Agency Limited	**N3 – Epworth Road Interchange Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the upgrading of the N3 – Epworth Road Interchange, Pietermaritzburg	Wetland and Biodiversity Specialist
Millennium Challenge Account - Mozambique	**Nacala Dam rehabilitation Biodiversity Assessment** Undertaking of the biodiversity specialist study in support of the Application for an Environmental Permit for the rehabilitation and raising of the Nacala Dam, Mozambique.	Biodiversity Specialist
WSP Environmental	**SAPPI Ngodwana Mill Expansion Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the expansion of the Ngodwana Mill, Waterval Boven.	Wetland and Biodiversity Specialist
South African National Roads Agency Limited	**N3 – Chota Motala Road Interchange Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the upgrading of the N3 – Chota Motala Road Interchange, Pietermaritzburg.	Wetland and Biodiversity Specialist
South African National Roads Agency Limited	**R30 Glen Lyon to Brandfort Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the upgrading of the R30 between Glen Lyon and Brandfort.	Wetland and Biodiversity Specialist
South African National Roads Agency Limited	**R30 Virginia to Beatrix Mine Wetland and Biodiversity Assessment** Undertaking of the wetland and biodiversity specialist study in support of the Application for Environmental Authorisation for the upgrading of the R30 between Virginia and Beatrix Mine.	Wetland and Biodiversity Specialist

Previous Experience

Client	Project Description	Role/ Responsibility
Miranda Minerals	**Sesikhona Colliery Wetland and Biodiversity Assessment** Undertaking the wetland and biodiversity specialist study in support of the Mining Right Application for the establishment of the Sesikhona Colliery, Dannhauser.	Wetland and Biodiversity Specialist
Miranda Minerals	**Uithoek Colliery Wetland and Biodiversity Assessment** Undertaking the wetland and biodiversity specialist study in support of the Mining Right Application for the establishment of the Uithoek Colliery, Dundee.	Wetland and Biodiversity Specialist
Miranda Minerals	**Burnside Colliery Wetland and Biodiversity Assessment** Undertaking the wetland and biodiversity specialist study in support of the Mining Right Application for the establishment of the Burnside Colliery, Dundee.	Wetland and Biodiversity Specialist
Ultimate Goal	**Ultimate Goal Colliery Biodiversity Assessment** Undertaking the wetland and biodiversity specialist study in support of the Mining Right Application for the establishment of the Ultimate Goal Colliery, Dundee.	Biodiversity Specialist
Canton Trading	**Taylors Halt Quarry Wetland and Biodiversity Assessment** Undertaking the wetland and biodiversity specialist study in support of the Mining Right Application for the establishment of the Taylor Halt Quarry, Pietermaritzburg.	Wetland and Biodiversity Specialist
South African National Roads Agency Limited	**uMtamvuna Quarry Biodiversity Assessment** Undertaking the biodiversity specialist study in support of the Mining Right Application for the establishment of the SANRAL Quarry, Kokstad.	Biodiversity Specialist

APPENDIX B
IMPACT ASSESSMENT METHODOLOGY

IMPACT ASSESSMENT METHODOLOGY

Likely impacts associated with the proposed development on the identified aquatic and terrestrial biodiversity baseline have been identified through the undertaking of site visits, consultation of published information, comments from Interested and Affected Parties, comments from the relevant authority and independent assessment by the Environmental Project Team. Impacts have also been identified by the specialist assessments undertaken.

The impact assessment will make provision for the assessment of the following impacts:

- No-go impacts;
- Planning and design phase impacts;
- Construction phase impacts;
- Operational phase impacts;
- Decommissioning phase impacts; and
- Cumulative impacts.

Impacts identified were assessed according to the criteria outlined below. Each impact was ranked according to extent, duration, magnitude and probability. These criteria are based on the Department of Environmental Affairs and Tourism (DEAT) (now the Department of Environmental Affairs, Forestry and Fisheries) Guideline Document to the EIA Regulations(1998). A significance rating was calculated as per the methodology outlined below. Where possible, mitigatory measures were recommended for the impacts identified.

Status of the Impact

The impacts were assessed as having either of the following:

Table 1: Impact status classification

Classification	Definition
Negative effect	at a cost to the environment
Positive effect	a benefit to the environment
Neutral	Neutral effect on the environment

Extent of the Impact

The extent of each impact was rated as being one of the following:

Table 2: Impact extent classification

Classification	Definition
1	Site - within the boundaries of the development site
2	Local - the area within 5 km of the site
3	Municipal - the Local Municipality
4	Regional - The Province
5	National – South Africa
6	International – Southern Africa

Duration of the Impact

The duration of each impact was rated as being one of the following:

Table 3: Impact duration classification

Classification	Definition
1	Immediate - > 1 year
2	Short term – 1 to 5 years
3	Medium term – 6 to 15 years
4	Long Term – the impact will cease when the operation stops
5	Permanent – no mitigation measure will reduce the impact after construction

Magnitude of the Impact

The intensity or severity of each impact was rated as being one of the following:

Table 4: Impact severity classification

Classification	Definition
0	None – where the aspect will have no impact on the environment
2	Minor – where the impact affects the environment in such a way that natural, cultural and social functions / processes are not affected
4	Low – where the impact affects the environment in such a way that the natural, cultural and social functions / processes are slightly affected
6	Moderate – where the affected environment is altered but natural, cultural and social functions / processes continue, albeit in a modified way
8	High – natural, cultural or social functions / processes are altered to the extent that they will temporarily cease
10	Very high / unknown – natural, cultural or social functions / processes are altered to the extent that they will permanently cease

Probability of Occurrence

The likelihood of the impact actually occurring is indicated as either:

Table 5: Impact probability classification

Classification	Definition
0	None – the impact will not occur
1	Improbable – the possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate corrective actions
2	Low – there is a probability that the impact will occur
3	Medium – the impact may occur
4	High – it is most likely that the impact will occur
5	Definite / unknown – the impact will occur regardless of the implementation of any prevention or corrective actions, or it is not known what the probability will be, based on a lack of published information

Significance of the Impact

Based on the information contained in the points above, the potential impacts have been assigned a significance weighting (S). This weighting is formulated by adding the sum of the numbers assigned to extent (E), duration (D) and magnitude (M) and multiplying this sum by the probability (P) of the impact.

$$S = (E+D+M)*P$$

The significance weightings are ranked as:

Table 6: Impact significance rating

Impact rating	Definition
< 30	Low – the impact would not have a direct influence on the decision to develop in the area;
30 – 60	Medium – the impact could influence the decision to develop in the area unless it is effectively managed / mitigated;
> 60	High - the impact must have an influence on the decision-making process for development in the area.