Wetland Baseline and Impact Assessment for the proposed Harmony West Wits Reclamation Project

Merafong City Local Municipality, West Rand District Municipality, Gauteng Province, South Africa

6/25/2026

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Report Name	**Wetland Baseline and Impact Assessment for the proposed Harmony West Wits Reclamation Project**
Specialist Theme	Aquatic Biodiversity Theme
Project Reference	Harmony West Wits
Report Version	6/25/2026
Environmental Assessment Practitioner	EIMS ENVIRONMENTAL IMPACT MANAGEMENT SERVICES
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Declaration	The Biodiversity Company and its associates act as independent consultants in accordance with the requirements of the South African Council for Natural Scientific Professions. We confirm that we have no affiliation with, or vested financial interest in, the proponent, other than remuneration for professional services rendered in terms of the Environmental Impact Assessment Regulations. We have no conflicting interests in the proposed activity or any secondary developments arising from the authorisation of the project, and our work has been undertaken objectively and in accordance with accepted scientific principles.

[1] All work was undertaken under the guidance and supervision of a registered professional (Divan van Rooyen – Pr. Sci. Nat. 151272)

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1 Introduction

1.1 Background

The Biodiversity Company (TBC) was appointed to undertake a wetland baseline and risk assessment for the proposed Harmony West Wits Reclamation Project, located in the Merafong City Local Municipality, West Rand District Municipality, Gauteng Province (Figure 1-1). A 500 m area has been demarcated for the project to facilitate the identification of wetlands within the regulatory zone; this area is referred to as the 500 m Project Area of Influence (PAOI).

This assessment has been completed in accordance with the requirements of the published Government Notice (GN) 4167 by the Department of Water and Sanitation (DWS) (previously GN 509 of 2016 and GN 3139 of 2023). The said notice was published in the Government Gazette (no. 49833) under Section 39 of the National Water Act (Act no. 36 of 1998) in December 2023, for a Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses. The GN 4167 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a General Authorisation (GA), as opposed to a full Water Use Licence Application (WULA). A water use (or potential) qualifies for a GA under GN 4167 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM), provided the identified risks are all considered a low risk and the applicant is listed under Appendix D1 or Appendix D2 of the same notice. This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations (2014) (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020) in terms of NEMA, dated 20 March and 30 October 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation” (Reporting Criteria).

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making with regards to the ecological viability of the proposed development and related activities.

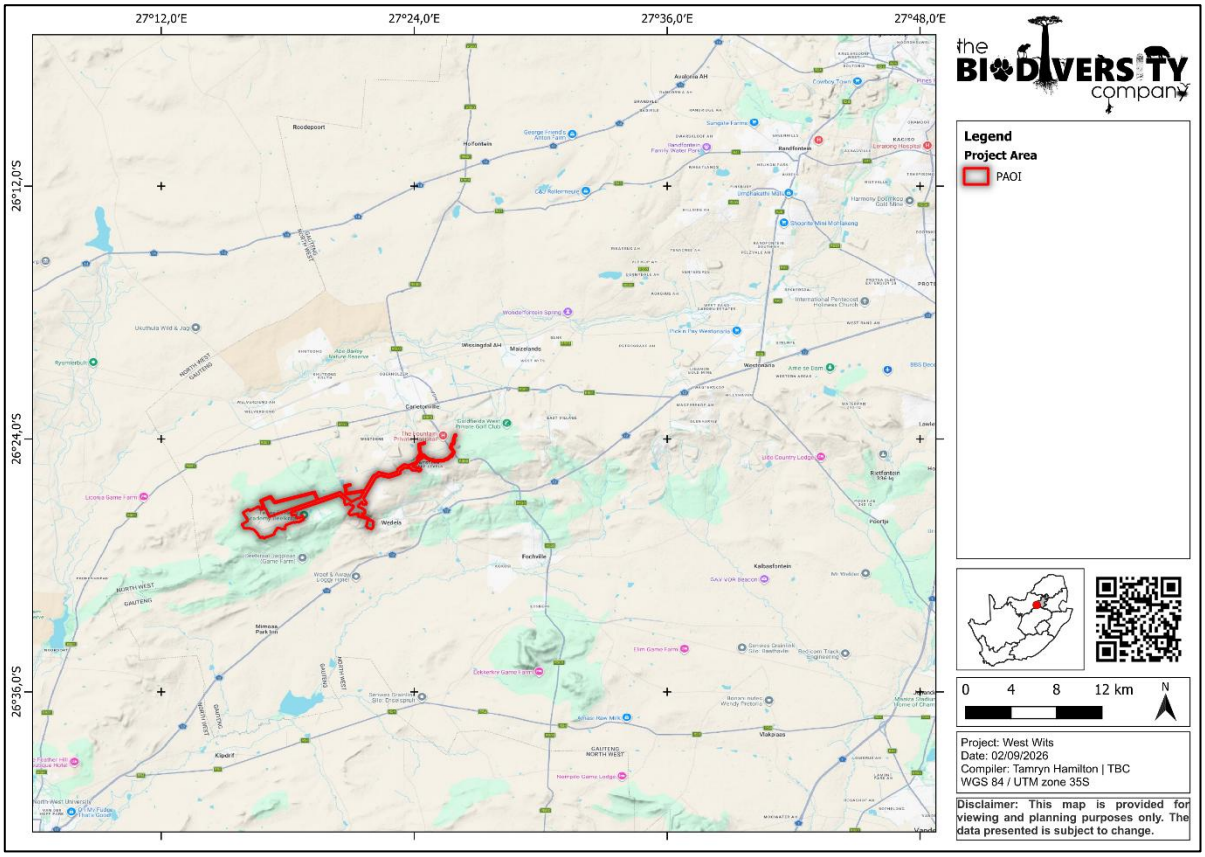


Figure 1-1 Location of the proposed project

1.2 Scope of Work

The following tasks were completed in fulfilment of the terms of reference for this assessment:

- A desktop assessment of available and related datasets to provide context of the freshwater biodiversity of the project area and to indicate potential wetland areas;
- The delineation, classification and assessment of wetlands within 500 m of the project area;
- An assessment of the related impacts through the use of the Risk Assessment Matrix (RAM) (DWS, 2023);
- The provision of recommendations relevant to associated impacts; and
- Report compilation detailing the baseline findings.

1.3 Project Description and Technical Information

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

The applicant requires additional deposition capacity for West Wits region's operations. The applicant plans on constructing the Deelkraal II Tailings Storage Facility (TSF) to cater for the additional future capacity. This TSF will receive residue from Kusasalethu, and Savuka plants and will also assist in returning process water for reclaiming the existing Deelkraal 1 TSF and Kusasalethu TSF for processing at Kusasalethu plant. Additional planned infrastructure includes slurry, potable, sewage and return water pipelines, access roads, pump stations, a return water dam and a power line. Proposed upgrades to the existing Kusasalethu plant are also proposed as part of the project.

The Savuka Plant treats tailings from the Savuka Dormant TSFs (Old North TSFs) at a rate of 330 000 tpm and deposits the subsequent tailings on Savuka 5 & 7 TSFs. Harmony plans on remining Deelkraal 1 Dormant TSF and Kusasalethu TSF amongst other potential future sources. These TSFs will be processed through the Kusasalethu Plant at 500 000 tonnes per month (tpm). The planned Life of Mine (LOM) for the West Wits region exceed the available deposition capacity of the existing TSFs. Therefore, additional deposition capacity is required.

The Kusasalethu Plant will accommodate future reclamation operations and will therefore need site/s to deposit the tailings. Harmony owns ground, located adjacent to the Deelkraal 1 Dormant TSF, that can be used i.e. for the proposed Deelkraal II TSF. The Deelkraal 1 Dormant TSF and adjacent virgin ground footprint combined geometry will accommodate the future reclamation operations deposition rate and capacity. The proposed TSF will cover an area of approximately 430 ha.

The West Wits Reclamation (WWR) Concept Study explores ways to unlock the potential of recycling historic gold tailings using the existing Kusasalethu and Savuka process plants and infrastructure. The Concept Study (SGS Bateman, 2024) evaluated different options for the treatment of the Deelkraal 1 and Kusasalethu Tailings Storage Facilities (TSF) at the existing processing plants. The reworked tailings will be deposited on a new TSF, referred to as Deelkraal II, assumed to be constructed on a site adjacent to the existing Deelkraal TSF. While reviewing the preliminary metallurgy testwork results it became evident that the Deelkraal TSF contained higher grades of accessible gold and it was agreed that that TSF would be reclaimed first, with the Kusasalethu TSF being reclaimed thereafter (SGS Bateman, 2024).

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

- A new Return Water Dam in the vicinity of the Deelkraal II TSF;
- Upgrades to the existing Kusasalethu plant including new/upgrade of gold and new uranium sections;
- Slurry pipelines:
    - Reclaimed Slurry from Deelkraal 1 to Kusasalethu (~10,6 km[2]);
    - Kusasalethu Barren Tailings to Deelkraal II and booster pump station (~10,2 km);
    - Reclaimed Slurry from Kusasalethu TSF to Kusasalethu Plant (~2 km);
    - Slurry pipeline from Kusasalethu Plant to Savuka TSF (~4,97 km); and
    - Slurry pipeline from Savuka plant to DF5 TSF (~2,9 km).
- Process Water Pipelines:
    - Process Water Feed from Kusasalethu Plant to Deelkraal Reclamation (~9.54 km);
    - Return Water Feed to Kusasalethu Process Water Tank (~9,58 km); -
    - Driefontein DP2 Pump Station to North Boundary Dam (~4,78 km); -
    - DP2 feed to Tau Tona Reverse Osmosis Plant (~0,1 km); -
    - Nursery Pumpstation #3 to Kusasalethu Process Water Tank (~9 km); and

[2] Lengths of pipelines and powerlines provided are approximate and could change by 1 – 2 km depending on the routing alternative selected

- 2 Process Water pipelines from Kusasalethu Plant to Savuka White Tanks (~8 km).

- Powerlines (all powerlines will be 22kV or lower):
  - Powerline from Kusasalethu Plant to the existing Deelkraal TSF (~9.2 km);
  - Powerline from Kusasalethu Plant to the Kusasalethu TSF (~1.8 km);
  - Powerline from Savuka shaft to Kusasalethu Plant (~8.1 km);
- Potable Water pipeline from Rand Water supply point to the Deelkraal TSF (~8.52 km).
- Deelkraal 1 TSF Reclamation Pump Station.
- Kusasalethu TSF Reclamation Pump Station.
- New Access Roads (2x3,5 m double road) adjacent to pipeline routes/OH lines and around Deelkraal II TSF (where no access road is already in place).
- Topsoil Stockpiles and overburden stockpiles.
- Ancillary construction infrastructure including workshops and laydown areas.

All pipelines listed above will be flanged steel pipelines installed above-ground on pre-cast concrete plinths and two 3.5 m wide access roads (double road), adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections (for areas where no access road is already in place). The diameter of the pipelines will be confirmed in the EIA phase once further design information becomes available.

The layout of the proposed project is presented in Figure 1-2 and Figure 1-3.

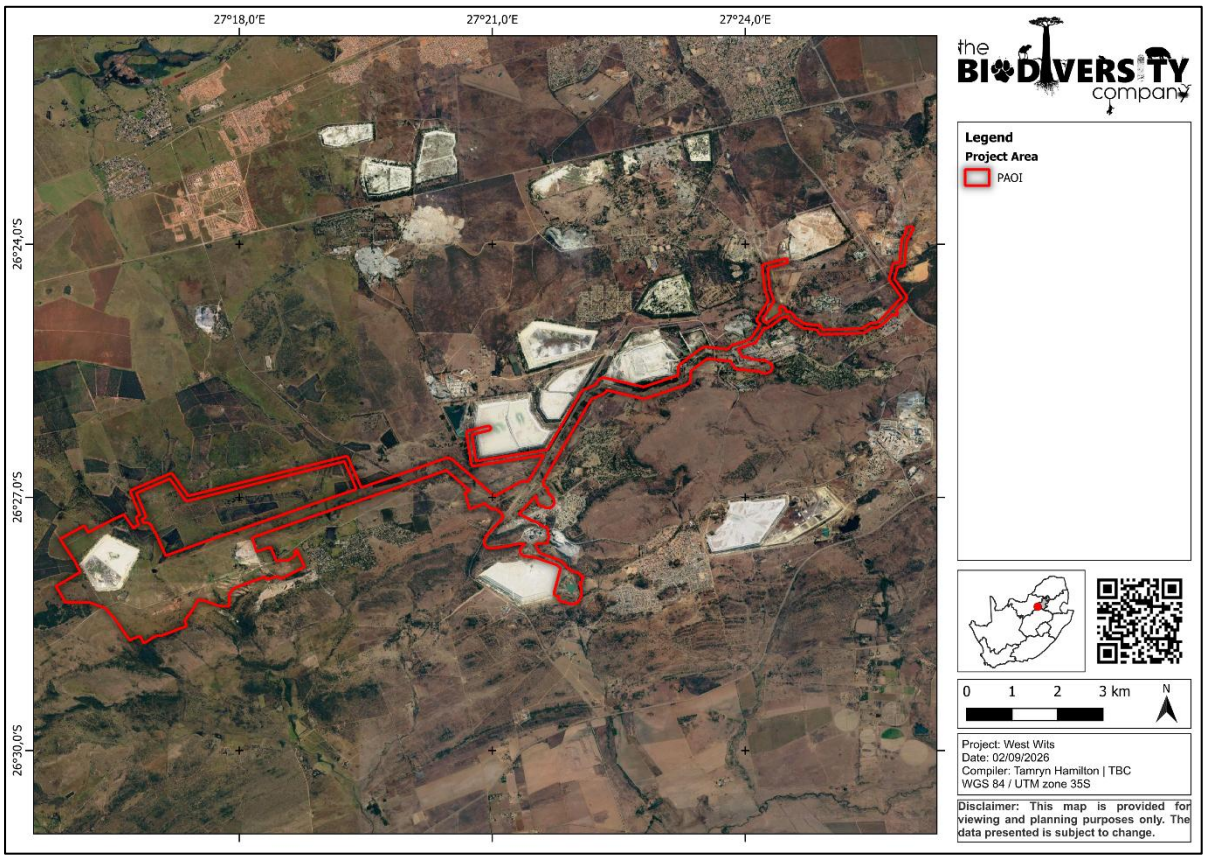


Figure 1-2 Proposed project site

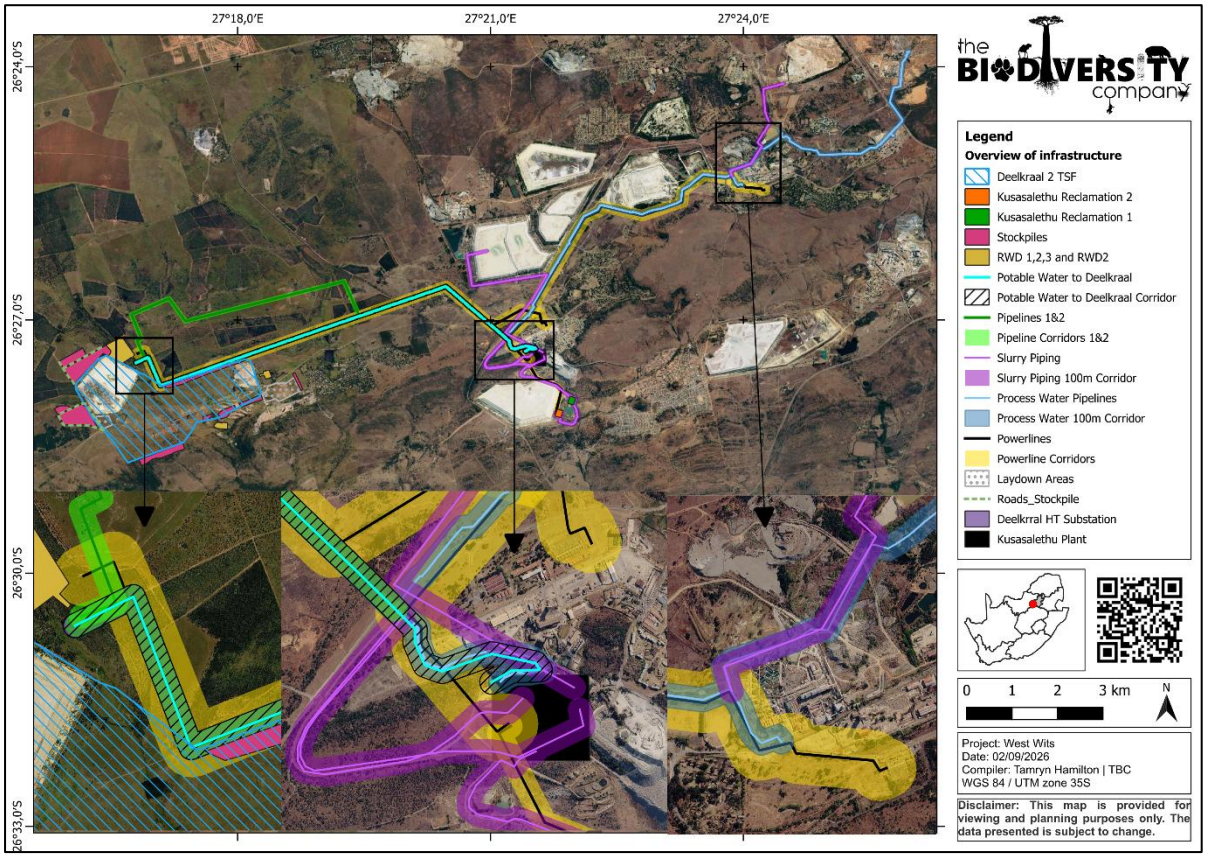


Figure 1-3 Proposed project layout components

1.4 Assumptions and Limitations

The following aspects were considered to be limitations of the assessment:

- It has been assumed that the spatial data provided to the specialist are accurate and suitable for the purposes of this assessment;
- Where inaccessible, freshwater features within the broader 500 m PAOI were delineated and assessed using desktop information and remote interpretation;
- The assessment focused on areas exhibiting external wetland indicators, with wetland presence thereafter confirmed through the identification of relevant soil form indicators;
- Only natural features were considered in the ecological component of this assessment;
- The GPS used for water resource delineation is accurate to within approximately five metres. As such, the digitally plotted wetland boundaries may be offset by up to five metres on either side;
- The field assessment was constrained by the time available for verification, as well as by access, safety and security limitations, including the presence of illegal miners and limited security escort capacity. Accordingly, representative sampling was undertaken and some portions of the site could not be assessed on foot, requiring greater reliance on observations from accessible areas and desktop interpretation. While the data obtained are considered sufficient to inform a meaningful freshwater ecological baseline for the study area, an additional

site survey of the under-surveyed areas, particularly the alternative pipeline corridor, is recommended to verify and refine the assessment findings.

1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements

Region	Legislation / Guideline	Comment
National	National Environmental Management Act (Act No. 107 of 1998) (NEMA)	To provide for the effective protection and controlled utilisation of the environment and for matters incidental thereto.
	NEMA: Environmental Impact Assessment Regulations (2014) (GNR 326, 7 April 2017), Appendix 6 requirements	Minimum content for specialist reports.
	NEMA: Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020)	The minimum criteria for reporting. Protocol for the specialist assessment and minimum report content requirements.
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA), Threatened or Protected Species Regulations	The protection of species and ecosystems that warrant protection.
	National Environmental Management: Waste Act (Act No. 59 of 2008)	The regulation of waste management to protect the environment.
	National Water Act (Act No. 36 of 1998) (NWA)	To provide for the regulation of water uses.
	NWA: Government Notice (GN) 4167 (previously GN 509 of 2016 and GN 3139 of 2023)	Water Use Licence (WUL) in terms of Section 21 (c) & (i) water uses and the provision to apply for a General Authorisation subject to usage and outcome of the Risk Assessment Matrix.
	NEMBA: Alien and Invasive Species Regulations (2014) (GNR R598, 1 August 2014). NEMBA: Alien and Invasive Species Lists (2020) (GN 1003, September 2020)	The regulation and management of alien invasive species.
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)	To provide for control over the utilisation of the natural agricultural resources, including the vegetation and the combating of weeds and invader plants.
Provincial	Transvaal Nature Conservation Ordinance (Act No. 12 of 1983)	To consolidate and amend the laws relating to nature conservation and to provide matters incidental thereto.
	Gauteng Conservation Plan (2024)	The spatial designation of conservation areas and targets within the province.

1.6 National Water Act (NWA, 1998)

The DWS is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of water resources, which includes:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

A watercourse means:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem and not just the water itself, constitutes a resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

1.7 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended in April 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact.

1.8 Legislative Framework

In line with the protocol for the specialist assessment and minimum report content requirements for environmental impacts on freshwater biodiversity, as per Government Notice 320 published in terms of NEMA, dated 20 March 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation” – the following has been assumed:

- An applicant intending to undertake an activity identified in the scope of this protocol on a site identified on the screening tool as being of:
    - “very high sensitivity” for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment;

Given that wetlands were identified within proximity of the Assessment Area, a Specialist Assessment Report was completed for the project.

An Aquatic / Freshwater Biodiversity Specialist Assessment Report must contain the information as presented in Table 1-2 below.

Table 1-2 Aquatic Biodiversity Specialist Assessment information requirements as per the relevant protocol, including the location of the information within this report

Information to be Included (as per GN 320, 20 March 2020)	Report Section
The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of aquatic sciences	9.4
Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae	9.4
A signed statement of independence by the specialist(s)	9.3

The assessment must be undertaken on the preferred site and within the proposed development footprint	1.3
A baseline description of the aquatic biodiversity and ecosystems on the site, including: aquatic ecosystem types; presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns.	3.1.4
The threat status of the ecosystem and species as identified by the screening tool	3.5.1
An indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free-flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area)	3.1.4
A description of the ecological importance and sensitivity of the aquatic ecosystem including: (a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g., movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and (b) the historic ecological condition (reference) as well as present ecological state of rivers (in- stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater)	3.3
The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate	3.2.1
Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions: Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal? Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present? How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include: (a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); (b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub-catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns); (c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and (d) to what extent will the risks associated with water uses and related activities change.	4.1
How will the proposed development impact on the functioning of the aquatic feature? This must include: (a) base flows (e.g., too little or too much water in terms of characteristics and requirements of the system); (b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g., seasonal to temporary or permanent; impact of over -abstraction or instream or off stream impoundment of a wetland or river); (c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g., change from an unchannelled valley-bottom wetland to a channelled valley -bottom wetland); (d) quality of water (e.g., due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication); (e) fragmentation (e.g., road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and (f) the loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g., waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.)	4.1
How will the proposed development impact on key ecosystems regulating and supporting services especially: (a) flood attenuation; (b) streamflow regulation; (c) sediment trapping; (d) phosphate assimilation; (e) nitrate assimilation; (f) toxicant assimilation; (g) erosion control; and	4.1

(h) carbon storage?	
How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	-
A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment	2.1
The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant	9.1
A description of the assumptions made, any uncertainties or gaps in knowledge or data	1.4
The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant	3.4
Additional environmental impacts expected from the proposed development	-
Any direct, indirect and cumulative impacts of the proposed development on site	4
The degree to which impacts and risks can be mitigated	4.3
The degree to which the impacts and risks can be reversed	-
The degree to which the impacts and risks can cause loss of irreplaceable resources	-
A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies	3.4
Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr)	4.3
A motivation must be provided if there were development footprints identified as having a “low” aquatic biodiversity sensitivity and that were not considered appropriate	1.8
A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and	7.2
Any conditions to which this statement is subjected	7.2

A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

2 Fieldwork

2.1 Freshwater Biodiversity Field Assessment

A field survey for the area was undertaken on the 27 and 28 May 2026 (Winter), which is an early dry-season survey, to identify the presence of freshwater features (wetlands) and to delineate their spatial extents. Furthermore, to determine vegetation composition of the identified features and the likelihood of features to be used as habitat for fauna. The seasonality is not considered to be a limiting factor to the assessment, and the results of this assessment are conclusive.

3 Results & Discussion

3.1 Desktop Dataset Assessment

3.1.1 Climate

The climate associated with the predominant vegetation type, namely Gauteng Shale Mountain Bushveld, was used as a proxy to infer the climatic conditions of the region. The region is characterised by a summer rainfall regime and very dry winters. Mean Annual Precipitation (MAP) ranges from 600 to 750 mm, increasing from west to east and with rising altitude. Frost is frequent, particularly in the western and southern parts of the region (Figure 3-1; Mucina & Rutherford, 2006).

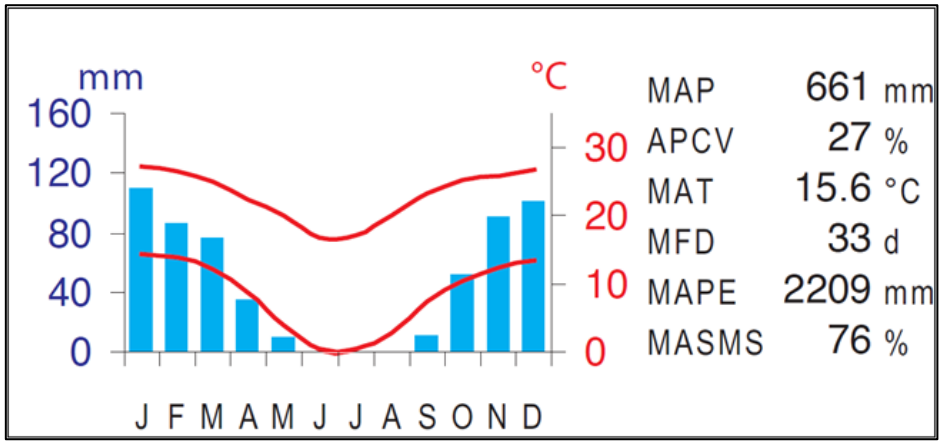


Figure 3-1 Climate for the project site based on the Gauteng Shale Mountain Bushveld (Mucina & Rutherford, 2006)

3.1.2 Soils and Geology

The geology associated with Gauteng Shale Mountain Bushveld is dominated by shale, with subordinate coarser clastic sediments and andesite of the Pretoria Group. In some parts of the area, Malmani dolomites of the Chuniespoort Group are also present. Soils are generally shallow and typically belong to the Mispah form, although deeper soils tend to occur at the footslopes. The vegetation type is predominantly associated with the Fb land type, although patches of the Ib land type also occur within its extent (Mucina and Rutherford, 2006).

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project site is characterised by the Fb 15 and Fb 5 land types. the project site is characterised by the Fb 15 and Fb 5 land types. The Fb land type is typically associated with Glenrosa and/or Mispah soil forms, with other soil forms occurring locally within the landscape. These soils are generally calcareous, indicating the widespread occurrence of lime in the area.

3.1.3 Hydrological Characteristics

The PAOI falls within the Highveld Ecoregion, within the Vaal-Orange Water Management Area (WMA). At a finer scale, within the C23E and C23J quaternary catchments. The fine scale hydrological features are presented in the following section.

3.1.3.1 Topographical River Lines and Inland Water Areas

The topographical inland and river line data for the “2627” quarter degree indicated multiple inland water areas within the 500 m PAOI, classified as dams, a large reservoir and a marsh vlei (Figure 3-2). Numerous non-perennial river line features were also identified within the 500 m PAOI.

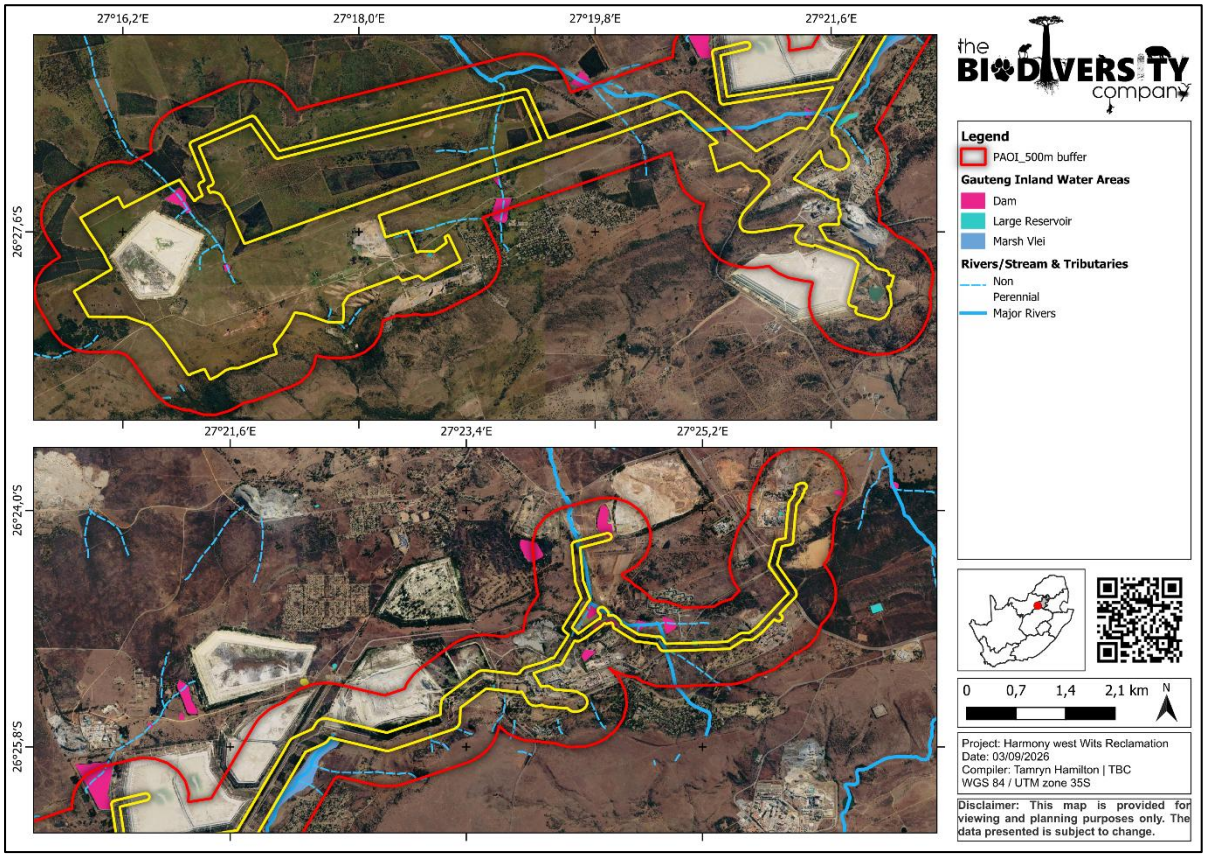


Figure 3-2 Topographical inland water areas and river lines that intersect the project site and 500 m project area of influence

3.1.4 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features are summarised in Table 3-1. Only features that were identified to be relevant to the proposed project were further discussed.

Table 3-1 Summary of relevance of the proposed project to ecologically important landscape features

Desktop Information Considered	Relevant/Irrelevant	Section
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Relevant – PAOI overlaps with SAIIAE wetlands and rivers.	3.1.4.1
National Freshwater Ecosystem Priority Area	Relevant – PAOI overlaps with NFEPA wetlands and rivers.	3.1.4.1
Provincial Conservation Plan	Relevant – PAOI overlaps with CBA and ESA areas.	3.1.4.2
Strategic Water Source Areas	Irrelevant – PAOI does not overlap with a SWSA.	-

3.1.4.1 South African Inventory of Inland Aquatic Ecosystems (SAIIAE) and National Freshwater Ecosystem Priority Areas (NFEPA)

According to the SAIIAE dataset, three wetland types were identified within the 500 m PAOI: multiple unchannelled valley-bottoms (UVB), channelled valley-bottoms (CVB), and seep wetlands (Figure 3-3). The UVBs were classified as “D/E/F – Largely to Heavily Modified”, as well as “Critically Endangered” and “Not Protected”. The CVBs were classified as “D/E/F – Largely to Heavily Modified”, as well as “Critically Endangered” and “Not Protected”. The seeps were classified as “A/B – Good Condition” and “D/E/F – Largely to Heavily Modified”, as well as “Critically Endangered” and “Not Protected”.

Additionally, two SAIIAE River tributaries of the Mooirivierloop were also identified within the 500 m PAOI and classified as “Critically Endangered” and “Not Protected”.

According to the NFEPA dataset, two wetland types were identified within the 500 m PAOI, classified as multiple seep wetlands and one wetland flat (Figure 3-3). The seeps were classified as “Artificial” and “Natural”, as well as “Z1/Z3 – Heavily to Critically Modified”. The wetland flat was classified as “Artificial”, as well as “Z1/Z3 – Heavily to Critically Modified”. Additionally, two NFEPA River tributaries of the Mooirivierloop were also identified within the 500 m PAOI and classified as “Z1/Z3 – Heavily to Critically Modified”.

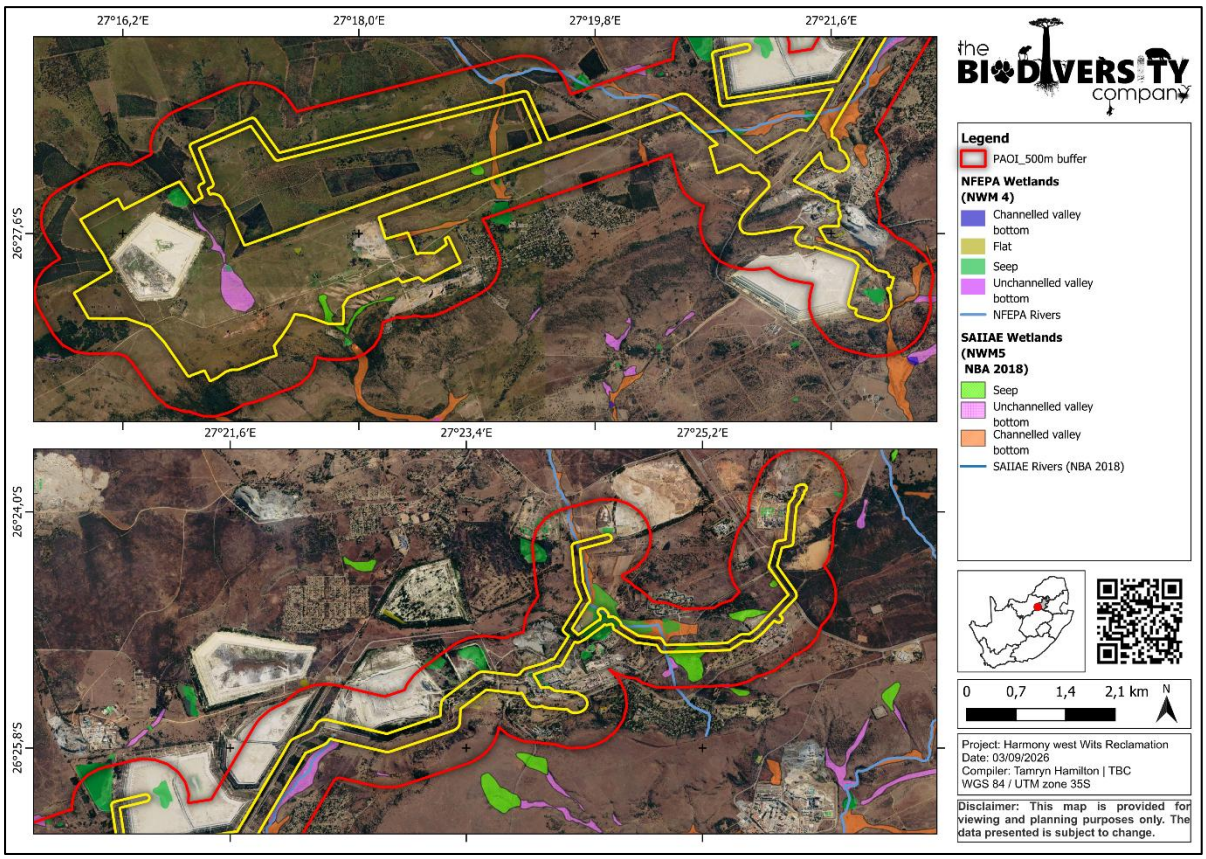


Figure 3-3 Wetland features identified within the project site and 500 m project area of influence according to the South African Inventory of Aquatic Ecosystems dataset as well as the National Freshwater Ecosystem Priority Areas dataset

3.1.4.2 Gauteng Conservation Plan and West Rand Bioregional Plan

According to the Gauteng Conservation Plan, the 500 m PAOI overlaps with Critical Biodiversity Areas (CBA 2) and Ecological Support Areas (ESA 1), and partially with Critical Biodiversity Areas (CBA 1) and Ecological Support Areas (ESA 2) (Figure 3-4). It is to be noted that the Gauteng Conservation Plan dataset does not have spatial data for aquatic ecosystems.

According to the West Rand District Bioregional Plan, the 500 m PAOI overlaps with Ecological Support Areas, and partially with Important Areas (Figure 3-4). It is to be noted that the West Rand District Bioregional Plan dataset does not have spatial data for aquatic ecosystems.

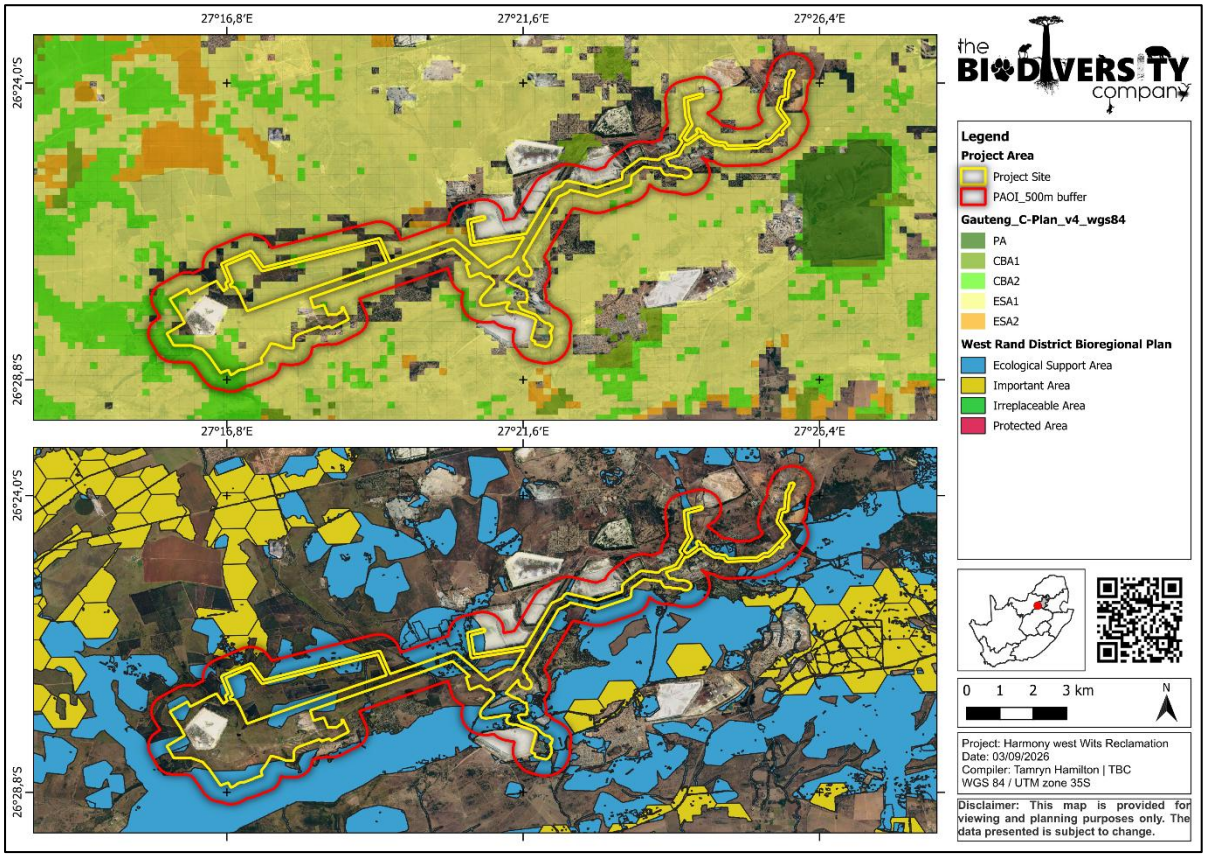


Figure 3-4 Gauteng Conservation Plan and West Rand Bioregional Plan overlay for the project site and 500 m project area of influence

3.2 Wetland Field Survey

3.2.1 Delineation

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

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

A functional description and assessment have been provided for all the identified natural wetland systems located within and/or proximal to the proposed project site and within the PAOI.

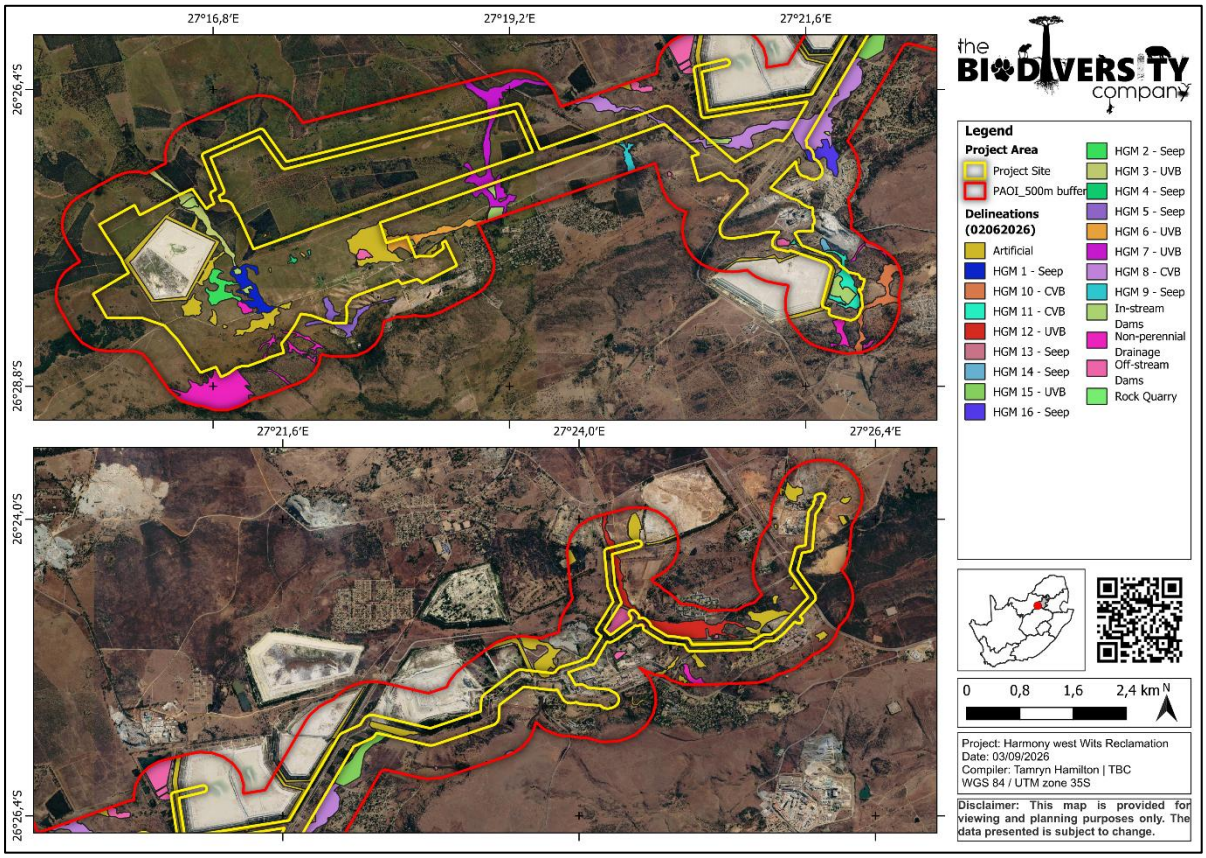


Figure 3-5 Delineation of wetlands and artificial features within the project footprint and 500 m project area of influence

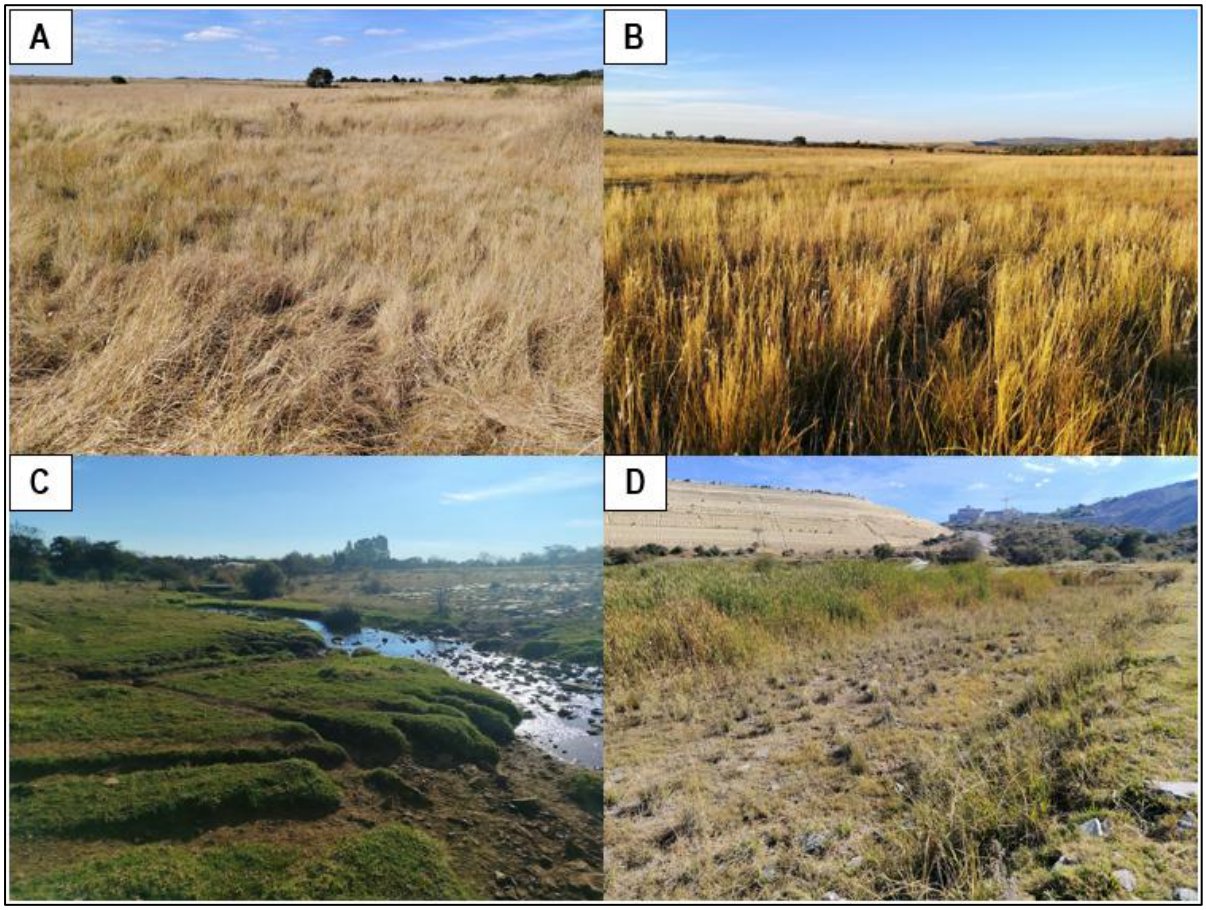


Figure 3-6 Representative photographs of the water features within the project footprint. A) HGM 1 Seep; B) HGM 6 UVB; C) HGM 8 CVB; and D) HGM 11 CVB

3.2.2 Classification and Description

The wetland classification as per SANBI guidelines (Ollis *et al.,* 2013) is presented in Table 3-2.

Table 3-2 Wetland classification as per SANBI guideline (Ollis et al., 2013)

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

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

positions that either cause groundwater to discharge to the land surface or rain-derived water to seep down-slope as subsurface interflow. This unique hydrological setting allows seeps to support specific vegetation adapted to these conditions, contributing to their ecological significance in the landscape. Figure 3-7 illustrates a diagram of the hillslope seeps, showing the dominant movement of water into, through and out of the system.

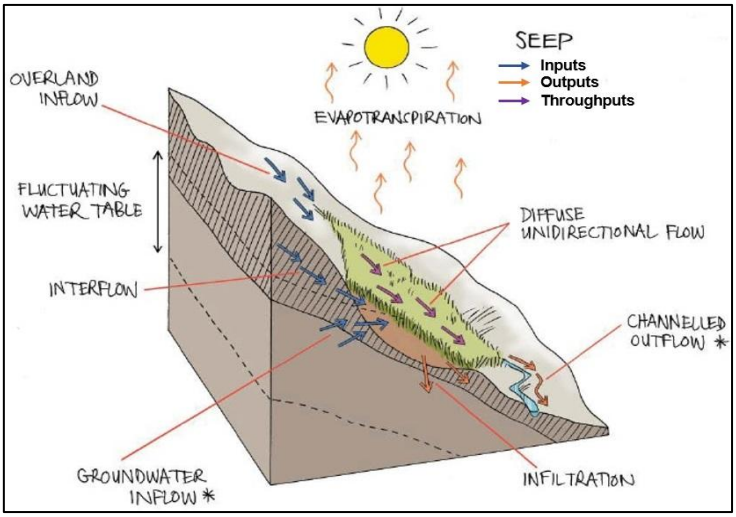


Figure 3-7 Amalgamated diagram of a typical hillslope seep, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

An unchannelled valley-bottom wetland, is a wetland located on a valley floor, characterised by the absence of a distinct river channel (Ollis *et al.,* 2013). These wetlands are defined by their diffuse water flows, which are not confined within channel banks, allowing water to spread across the valley floor. The primary water inputs for unchannelled valley-bottom wetlands include diffuse surface and subsurface flows from upstream channels that lose confinement, as well as seepage from adjacent valley side-slopes. The hydrodynamics of these wetlands are dominated by horizontal, unidirectional, diffuse surface flow, although infiltration and evapotranspiration can also be significant. This setting allows unchannelled valley-bottom wetlands to function as important sites for sediment deposition, water filtration, and habitat provision, supporting a diverse range of plant and animal species. Their unique hydrological and geomorphological characteristics make them vital components of the landscape, contributing to the overall ecological health of the valley systems in which they occur. Figure 3-8 presents a diagram of a typical unchannelled valley-bottom wetland, showing the dominant movement of water into, through and out of the system.

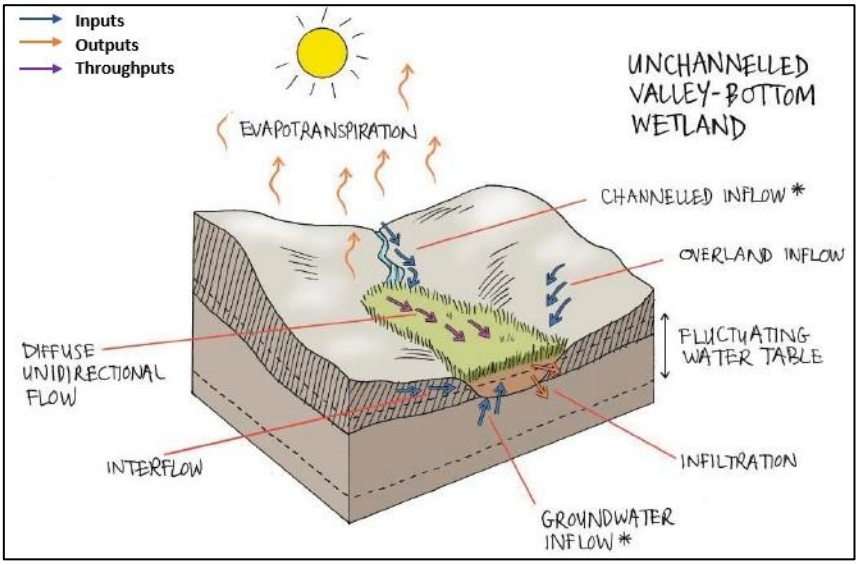


Figure 3-8 ***Amalgamated diagram of a typical unchannelled valley bottom, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

A channelled valley-bottom wetland, is a wetland ecosystem located along a valley floor, characterised by the presence of a river channel running through it (Ollis *et al.,* 2013). These wetlands are distinct from floodplain wetlands due to the absence of characteristic floodplain features and the presence of a defined river channel. The landscape setting of a channelled valley-bottom wetland typically involves a valley floor where the wetland receives water inputs from the river channel, either as surface flow during flooding or as subsurface flow, and from adjacent valley side-slopes through overland flow or interflow. The hydrodynamics of these wetlands are influenced by the river channel, which provides a concentrated flow of water, contributing to the wetland's ecological functions such as sediment trapping, nutrient cycling, and habitat provision. This setting makes channelled valley-bottom wetlands crucial for maintaining the ecological integrity of riverine systems and supporting biodiversity. Figure 3-9 presents a diagram of a typical channelled valley bottom, showing the dominant movement of water into, through and out of the system.

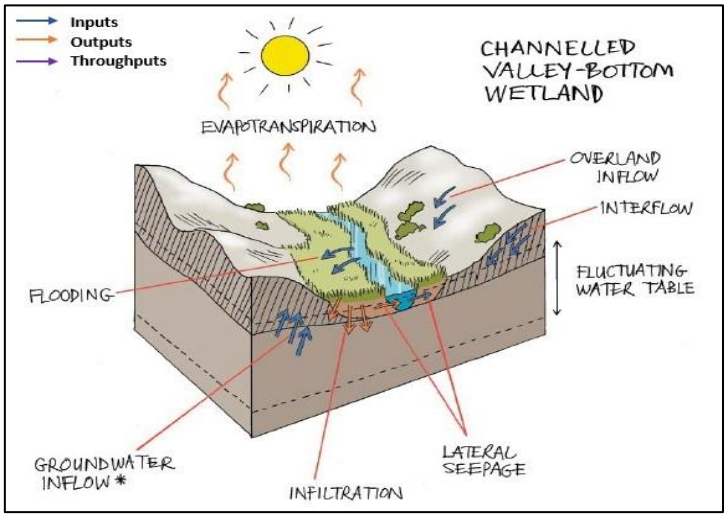


Figure 3-9 ***Amalgamated diagram of a typical channelled valley bottom, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

The DWAF (2005) manual separates the classification of watercourses into three (3) separate types of channels or sections defined by their position relative to the zone of saturation in the riparian area. The classification system separates channels into:

- those that do not have baseflow ('A' Sections);
- those that sometimes have baseflow ('B' Sections) or non-perennial; or
- those that always have baseflow ('C' Sections) or perennial.

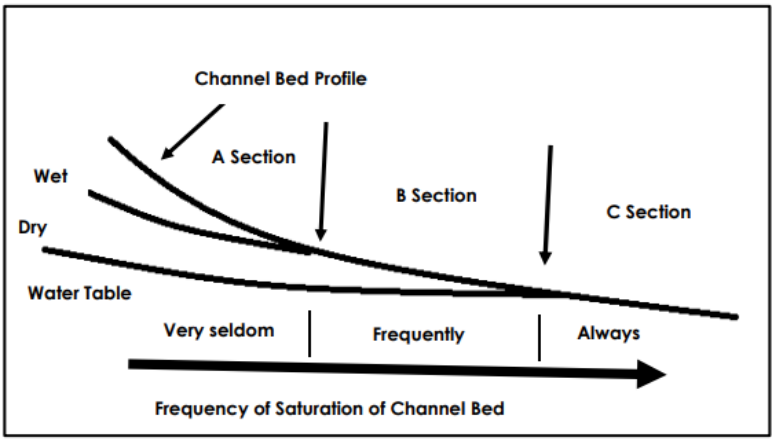


Figure 3-10 The watercourse classifications (DWAF, 2005)

3.3 Wetland Functional and Ecological Assessment

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

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

3.3.1 Functional Assessment

3.3.1.1 General Functional Description

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

Unchannelled valley-bottom wetlands are characterised by their location in valley bottoms without a distinct stream channel, resulting in diffuse water flow across the wetland. These wetlands are highly effective in sediment trapping due to their gentle gradients and the extensive areas that remain permanently saturated, which promote the deposition of sediments carried by runoff waters. The high levels of soil organic matter in these wetlands enhance their capacity for nitrate and toxicant removal, as the prolonged contact with runoff waters facilitates these processes. However, phosphate retention may be lower compared to other wetland types due to potential remobilization under prolonged anaerobic conditions. Unchannelled valley-bottom wetlands also contribute to streamflow regulation to some extent, although this is influenced by factors such as vegetation transpiration and soil characteristics. These wetlands play a crucial role in maintaining water quality and providing habitat for diverse species, making them vital components of the landscape (Kotze et al., 2009).

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

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

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

3.3.1.2 Ecosystem Services

The ecosystem services provided by the relevant wetland units on site were assessed and rated using the WET-EcoServices method (Kotze *et al.,* 2020). The results of the assessment are presented in Table 3-3. The average ecosystem services scores fall within the range of “Moderately-Low” to “Moderately-High”. Ecosystem services contributing to these scores include flood attenuation, streamflow regulation, sediment trapping, erosion control, phosphate assimilation, nitrate assimilation and toxicant assimilation.

Table 3-3 Summary of the average ecosystem scores for the assessed systems

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

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

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

Wetlands in the Moderately-High category comprise predominantly channelled valley-bottoms (CVBs) and one unchannelled valley-bottom (UVB) system. These wetlands are relatively more intact than the other assessed systems, with greater wetland vegetation cover, stronger hydrological connectivity, and closer association with larger wetland systems. Consequently, they retain a comparatively stronger capacity to provide ecosystem services, particularly streamflow regulation, flood attenuation, sediment

trapping, water quality improvement, carbon sequestration, and biodiversity support. Their improved vegetation structure and hydrological functioning also indicate a greater ability to sustain regulating and supporting services at a broader landscape scale. Nevertheless, these systems are still located within a mining-influenced landscape and are therefore not fully intact. Even so, relative to the Moderately-Low and Moderate groups, they represent the better-functioning wetlands within the study area, with a higher capacity for ecosystem service delivery and ecological resilience.

3.3.2 Present Ecological State

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

Table 3-4 Average Present Ecological State scores for the assessed wetlands

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

Impacts on the wetlands include:

- Natural flow paths, hydroperiods, and wetland connectivity have been altered by mining infrastructure, disturbed ground, berms, roads, and artificial runoff inputs, with additional disruption from informal settlement drainage and trampling.
- Indigenous wetland vegetation has been reduced and disturbed by mining-related transformation, while ongoing grazing, trampling, and informal occupation have simplified vegetation structure and limited natural recovery.

- Wetland form and substrate have been modified by historic excavation, infilling, compaction, erosion, sediment deposition, and the creation of informal access routes and disturbed drainage features.

- Wetlands are affected by sediment-laden and potentially contaminated runoff from mining-disturbed areas, together with waste, greywater, and sanitation-related inputs associated with informal settlements and livestock.

3.3.3 Ecological Importance and Sensitivity

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

Table 3-5 Summary of the Ecological Importance and Sensitivity assessment

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

3.3.4 Recommended Ecological Category and Recommended Management Objective

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

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

Table 3-6 Recommended Ecological Category and Management Objective

HGM No.	Recommended Ecological Category	Recommended Management Objective
HGM 1 HGM 2	E/F	Improve

HGM 3 HGM 5 HGM 6 HGM 8 HGM 11 HGM 12 HGM 14 HGM 15 HGM 16		
HGM 4 HGM 7 HGM 9 HGM 10 HGM 13	C/D	Improve

3.4 Buffer Requirements

The buffer requirements for the wetlands were calculated using the Site-Based Tool: Determination of buffer zone requirements for wetland ecosystems (Macfarlane *et al.,* 2014). The recommended buffer zones are presented in Figure 3-11 & Figure 3-12. The recommended post-mitigation buffers for the construction and operational phase of the development are 25 m for the floodplain wetlands and 15 m for the non-perennial watershed features as presented in Table 3-7.

Table 3-7 Recommended buffers for the proposed development

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

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

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

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

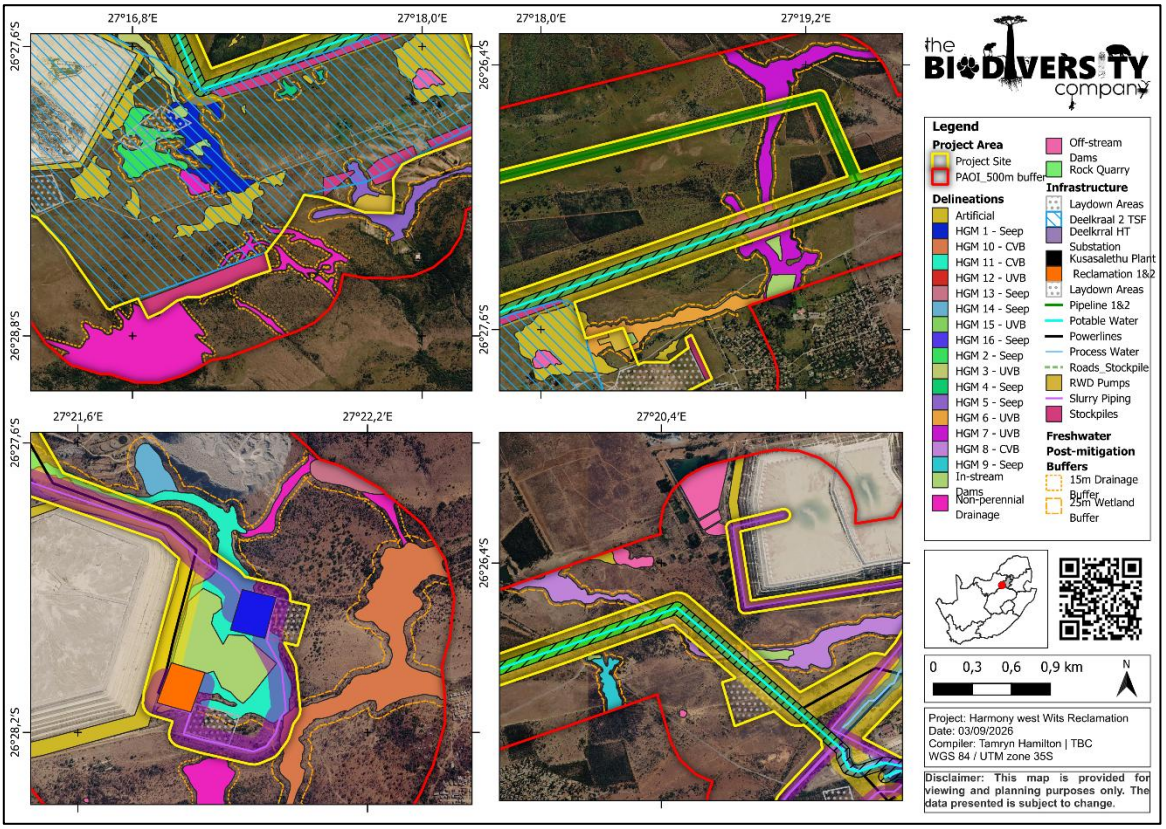


Figure 3-11 Recommended post-mitigation buffers for the identified wetlands in relation to the proposed project footprint

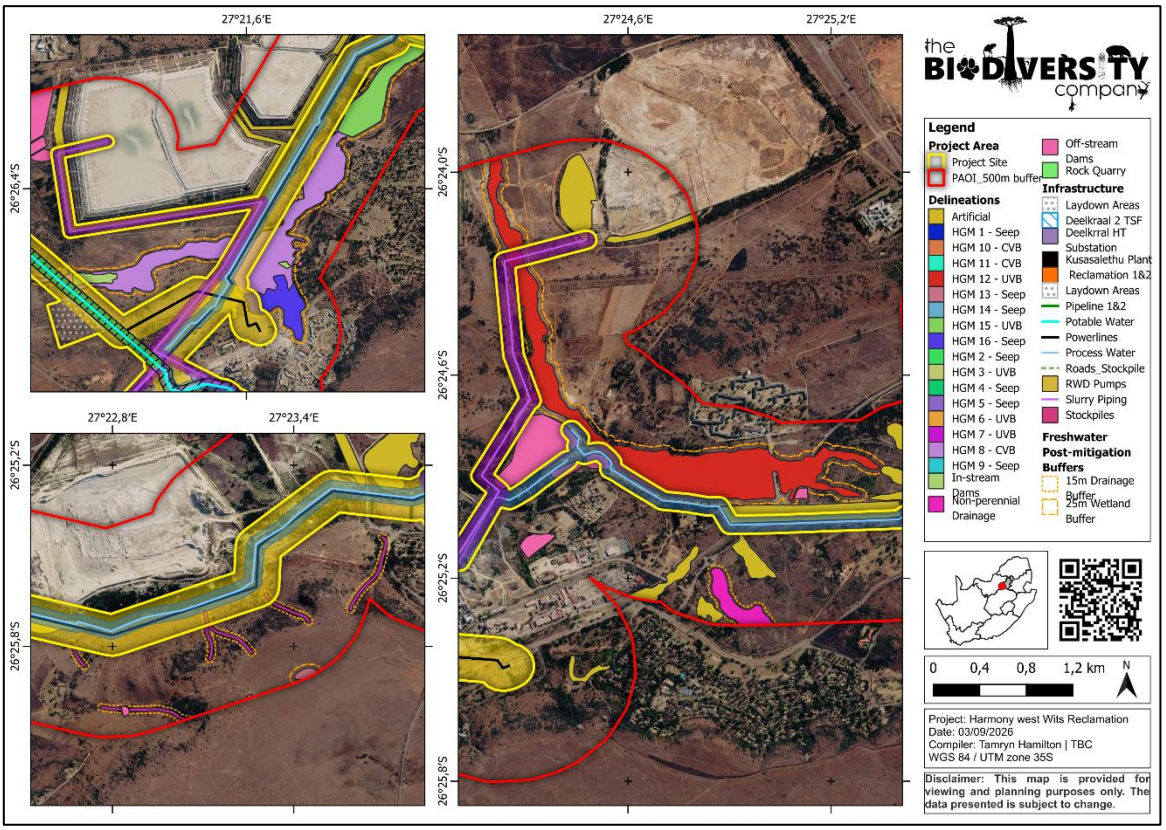


Figure 3-12 Recommended post-mitigation buffers for the identified wetlands in relation to the proposed project footprint

3.4.1 Regulation Zones

Table 3-8 presents the legislated zones of regulation that would be applicable to the wetland areas.

In accordance with Government Notice (GN) 4167 of 2023 as it relates to the NWA (1998), the regulated area of a watercourse for Section 21 (c) and 21 (i) of the NWA (1998) must be considered if the proposed development and associated infrastructure fall within the applicable zones of regulation as defined in the Act.

Listed activities in terms of the NEMA (1998), (Act 107 of 1998) EIA Regulations as amended in April 2017 must be taken into consideration if any infrastructure is to be placed within the applicable zone of regulation.

Both the NWA (1998) and NEMA (1998) authorisation frameworks are applicable to the proposed project, as the proposed project site and/or associated infrastructure occur within the legislated zones of regulation associated with the delineated wetlands (Figure 3-13).

Table 3-8 Legislated zones of regulation

Regulatory authorisation required	Zone of applicability
Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998). GN 4167 as published in the Government Gazette 49833 of 2023.	In accordance with GN4167 of 2023 as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21c and 21i is defined as: the outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; in the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.
Environmental Authorisation in terms of the Listed activities of the National Environmental Management Act, 1998 (Act No. 107 of 1998). EIA Regulations (2014), as amended.	Activity 12 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that: The development of: (xii) Infrastructure or structures with a physical footprint of 100 square metres or more; Where such development occurs— Within a watercourse; In front of a development setback; or If no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. (dd) where such development occurs within an urban area… Activity 19 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA regulations, 2014 (as amended) states that: "The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse."

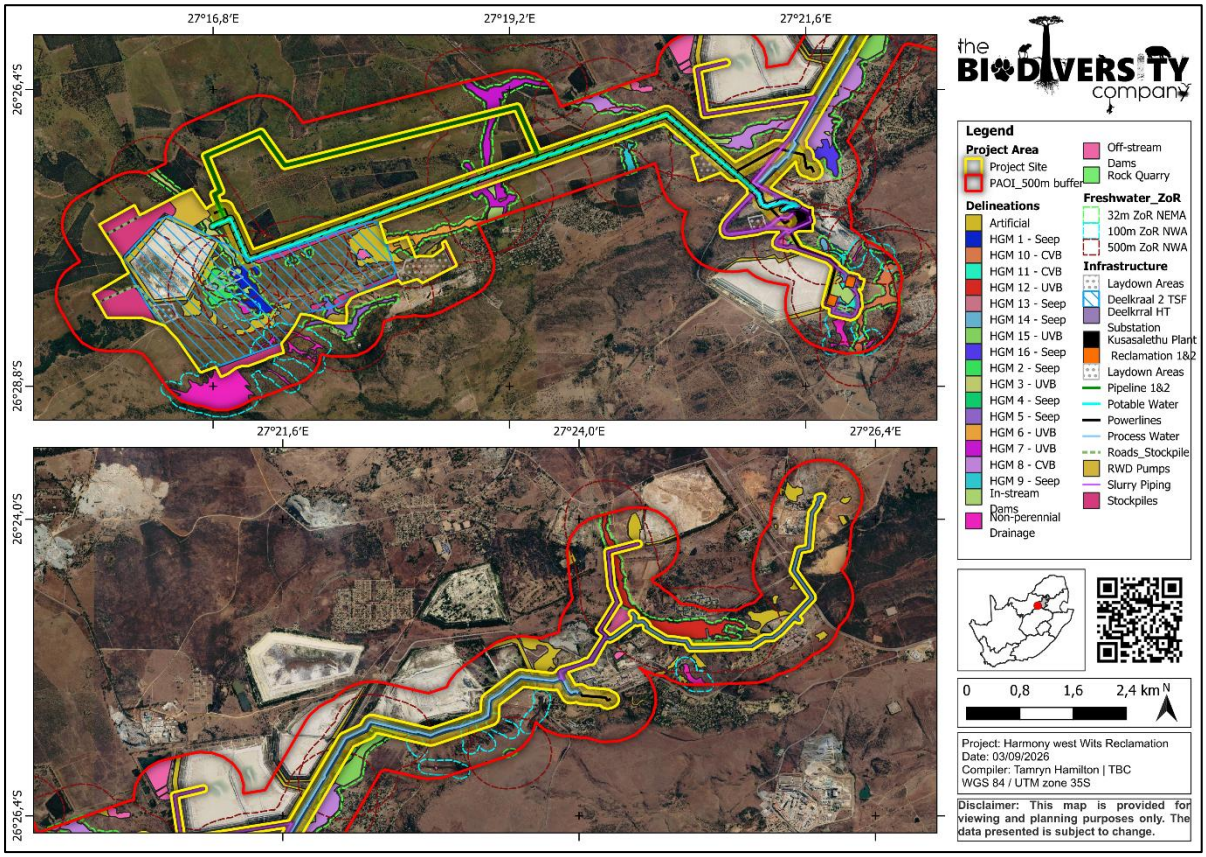


Figure 3-13 The Zones of Regulations in relation to the delineated systems

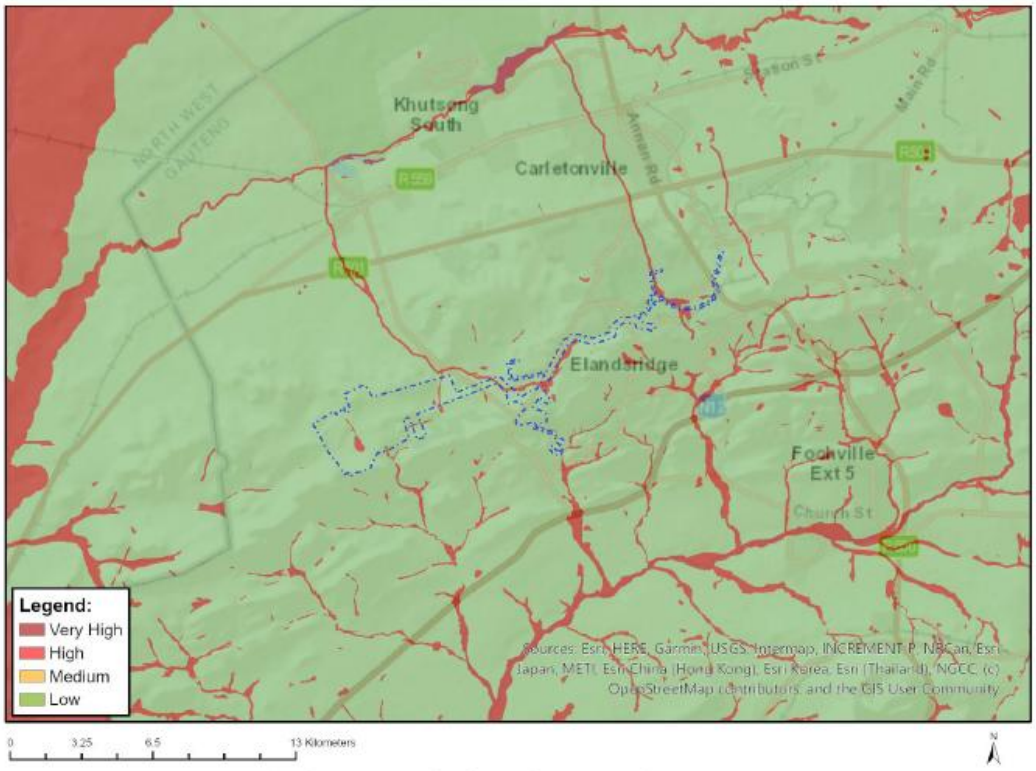
3.5 Site Sensitivity Verification

3.5.1 Desktop Ecological Sensitivity

The following is deduced from the National Web-based Environmental Screening Tool (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended):

- Aquatic Biodiversity Theme sensitivity as partly “Low” for the project site with areas of “Very High” sensitivity assigned for the presence of wetlands and rivers (Figure 3-14).

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Wetlands_Channelled valley-bottom
Very High	Wetlands_Seep
Very High	Wetlands_Unchannelled valley-bottom
Very High	Rivers

Figure 3-14 Aquatic Biodiversity Theme Sensitivity for the project footprint

3.5.2 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas in Table 3-9 below. A summative explanation for each result is provided as relevant. The specialist-assigned sensitivity ratings are based largely on the PES and EIS assessment processes followed in the previous section, and consideration is given to any observed or likely presence of sensitive fauna and flora. The sensitivities are displayed in Figure 3-15.

Table 3-9 Summary of the screening tool vs specialist assigned sensitivities

Features	Screening Tool Theme	Environmental Screening Tool Sensitivity	Specialist Sensitivity	Tool Validated or Disputed by Specialist - Reasoning
Wetlands and In-stream Dams	Aquatic Biodiversity Theme	Very High	High/Very High	**Validated** – These areas are representative of natural wetlands and wetland-associated systems, with High/Very High sensitivity attributed to the presence of wetland habitat, hydrological functioning, and wetland vegetation. Their importance is increased within the transformed mining landscape.
		Low	High/Very High	**Validated** – These areas are representative of natural wetlands and wetland-associated systems, with High/Very High sensitivity attributed to the presence of wetland habitat, hydrological functioning, and wetland vegetation. Their importance is increased within the transformed mining landscape.
Drainage Features	Aquatic Biodiversity Theme	Very High Low	Moderate	**Disputed** – These drainage features contribute to the hydrological functioning of adjacent wetlands and are assigned Moderate sensitivity due to their functional role, although they are generally more disturbed than intact wetlands.
Freshwater Buffers	Aquatic Biodiversity Theme	Low	Moderate	**Disputed** – These areas form part of the wetland and drainage feature buffer/peripheral zone and are of Moderate sensitivity due to their role in protecting aquatic systems from surrounding disturbance.
Artificial Features, Off-stream Dams and Rock Quarry	Aquatic Biodiversity Theme	Low	Low	**Validated** – These areas are not representative of natural wetlands and lack typical wetland indicators.
Remaining Area	Aquatic Biodiversity Theme	Low	Low	**Validated** – These areas are not representative of natural wetlands or associated aquatic features and lack typical wetland indicators.

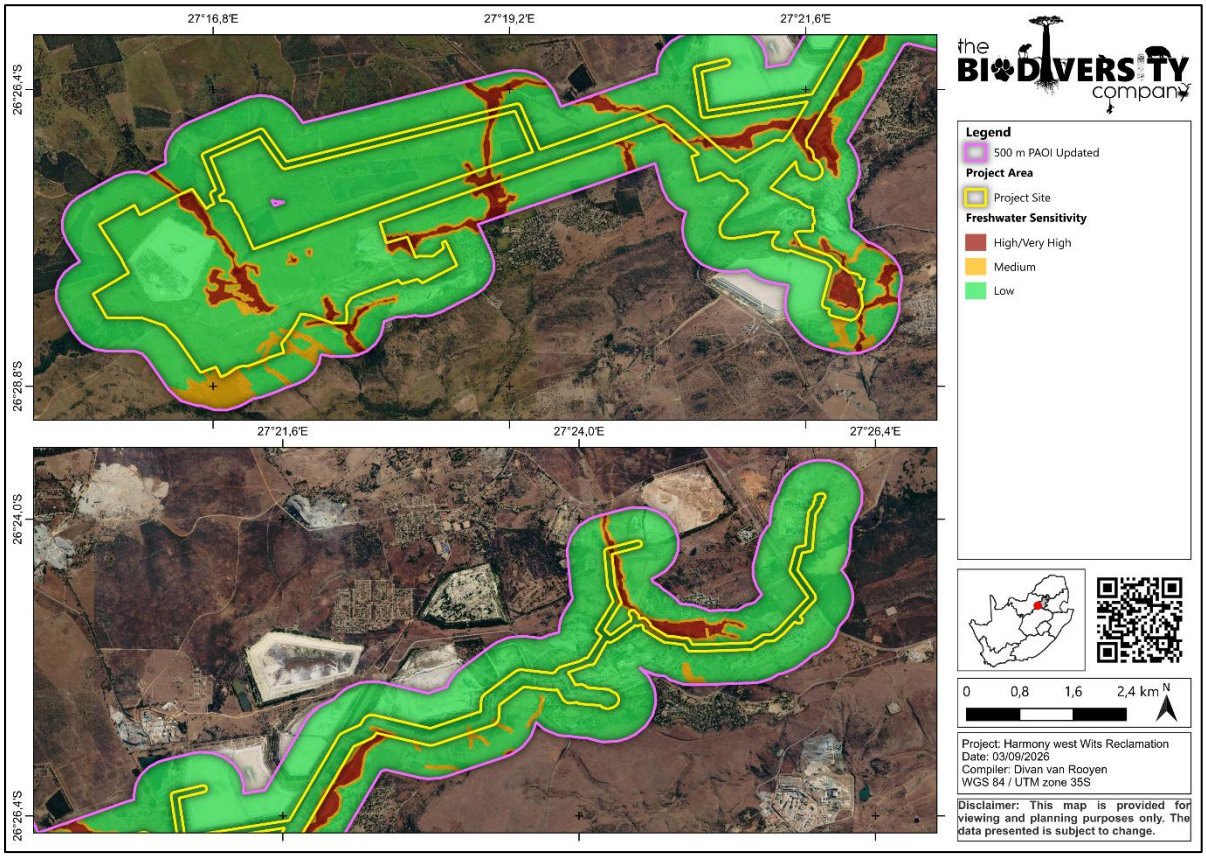


Figure 3-15 Freshwater Sensitivity for the project footprint

4 Risk and Impact Assessment

4.1 Alternatives

Two alternative pipeline corridors are being considered within the proposed project site. However, both alternatives present the same type and magnitude of risk, with no significant differentiating factors warranting separate assessment. As such, the risk assessment presented herein is considered sufficient to assess both alternatives.

4.2 Quantitative Risk and Impact Assessment

The Risk / Impact Assessment considered the indirect impacts, to the wetland systems. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (Figure 4-1). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in project location, siting, scale, layout, technology and phasing to avoid impacts.

A risk assessment was conducted for the proposed PAOI (Table 4-1). Wetlands were identified within the 500 m PAOI, therefore impacts to the systems are potential. The focus for mitigation was thus placed on minimising potential impacts.

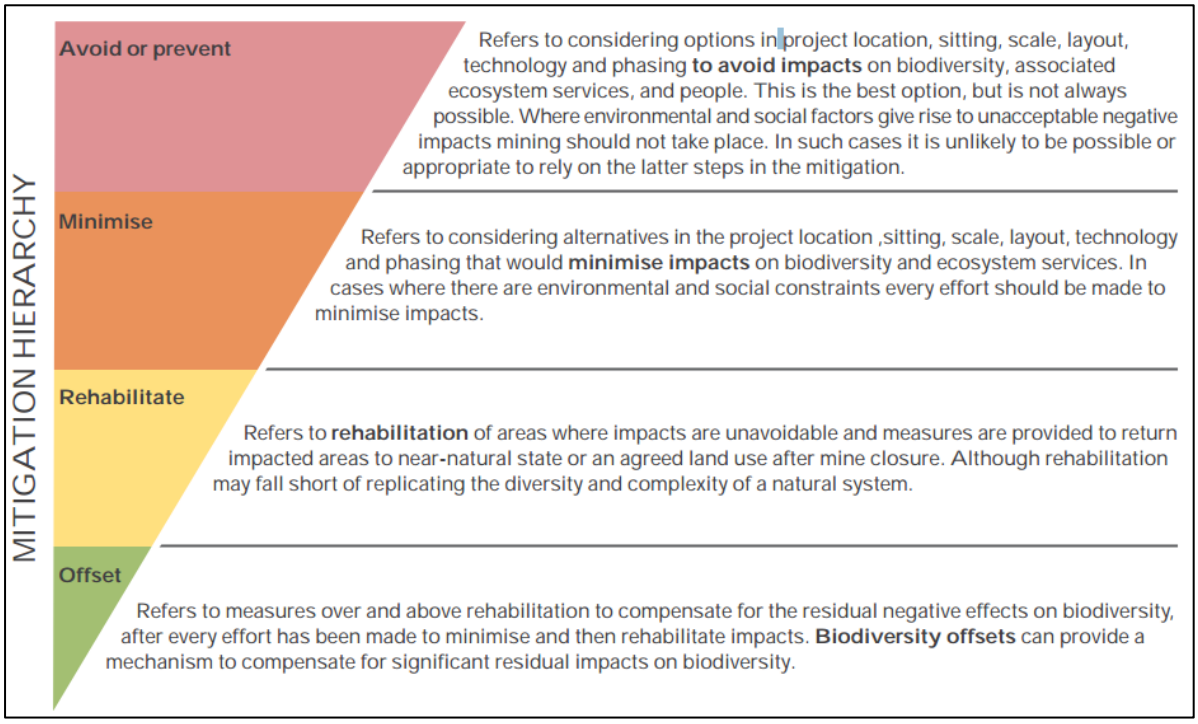


Figure 4-1 The mitigation hierarchy as described by the DEA (2013)

The RAM indicates that, following mitigation, most project components are expected to pose Low to Moderate residual risk to the identified wetlands, particularly the linear infrastructure and mining plant infrastructure components. Moderate residual risks are mainly associated with infrastructure that intersects wetlands, drainage features or their associated buffers, but these risks can be reduced through micro-siting, the spanning of crossings where feasible, and the implementation of the prescribed mitigation measures and buffer controls.

By contrast, the proposed TSF component is associated with a High residual risk where the footprint directly overlaps wetland habitat, due to the extent of direct wetland loss and disturbance that would result. While avoidance remains preferable in principle, the scope for materially shifting the TSF and associated infrastructure is recognised to be limited. Accordingly, where wetland loss cannot

reasonably be avoided, mitigation should focus on minimising the disturbance footprint and rehabilitating the remaining impacted and hydrologically connected wetland systems within the broader development area, particularly the residual and adjoining portions of HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas. Detailed rehabilitation requirements are provided in Section 6. Offsetting should be considered only as a last resort for residual wetland loss that remains unavoidable after minimisation and rehabilitation measures have been applied.

The RAM was undertaken based on the project information and layout available at the time of assessment. Should the layout be amended, the RAM and associated risk ratings should be reviewed and updated accordingly.

Table 4-1 Summative results of the DWS Risk Assessment conducted for the proposed industrial park development

Phase	Activity	Impact	Potentially affected watercourses	Significance (max = 100)	Risk Rating	Confidence level
			Name/s			
CONSTRUCTION	**Construction of TSF (Deelkraal II TSF) (Within 500 m of wetlands and within 100 m of drainage features)** Site establishment, vegetation clearing, topsoil stripping, bulk earthworks, embankment/platform construction, stormwater control installation, and construction vehicle movement	Vegetation and habitat disturbance	HGM 1 - 16	**24**	**L**	High
		Erosion and sedimentation of wetlands	HGM 1 - 16	**24**	**L**	High
		Altered surface flow and wetland hydrology	HGM 1 - 16	**24**	**L**	High
		Polluted runoff and spill risk	HGM 1 - 16	**24**	**L**	High
		Dust and disturbance to wetland fauna	HGM 1 - 16	**24**	**L**	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	**18**	**L**	High
	Construction of Pipelines (slurry, process water and potable water pipelines) (Within 500 m of wetlands and within 100 m of drainage features) Route clearing, trenching or plinth preparation, pipeline installation, crossing works where required, and construction access along pipeline servitudes and alignments	Vegetation and habitat disturbance	HGM 1 - 16	**11.2**	**L**	High
		Erosion and sedimentation of wetlands	HGM 1 - 16	**11.2**	**L**	High
		Altered drainage and hydrological connectivity	HGM 1 - 16	**11.2**	**L**	High
		Hydrocarbon and construction-related contamination risk	HGM 1 - 16	**11.2**	**L**	High
		Soil compaction and wetland buffer degradation	HGM 1 - 16	**11.2**	**L**	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	**8.4**	**L**	High
	Construction of Powerlines (Within 500 m of wetlands and within 100 m of drainage features) Vegetation clearing, pole	Vegetation and habitat disturbance	HGM 1 - 16	**11.2**	**L**	High
		Erosion and sedimentation of wetlands	HGM 1 - 16	**11.2**	**L**	High

	foundation excavation, structure installation, conductor stringing, and access along the powerline route	Altered local drainage patterns	HGM 1 - 16	**11.2**	**L**	High
		Pollution from fuels, oils, and construction activities	HGM 1 - 16	**11.2**	**L**	High
		Disturbance to wetland fauna and soil compaction	HGM 1 - 16	**11.2**	**L**	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	**8.4**	**L**	High
	Construction of TSF (Deelkraal II TSF) (Intersecting wetlands and drainage features) Site establishment, vegetation clearing, topsoil stripping, bulk earthworks, embankment/platform construction, stormwater control installation, and construction vehicle movement	Wetland degradation	HGM 1 - 6	**64**	**H**	High
		Vegetation and habitat disturbance	HGM 1 - 6	**64**	**H**	High
		Erosion and sedimentation of wetlands	HGM 1 - 6	**64**	**H**	High
		Altered surface flow and wetland hydrology	HGM 1 - 6	**64**	**H**	High
		Polluted runoff and spill risk	HGM 1 - 6	**64**	**H**	High
		Dust and disturbance to wetland fauna	HGM 1 - 6	**64**	**H**	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	**48**	**M**	High
	Construction of Pipelines (slurry, process water and potable water pipelines) (Intersecting wetlands) Route clearing, trenching or plinth preparation, pipeline installation, crossing works where required, and construction access along pipeline servitudes and alignments	Wetland degradation	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High
		Vegetation and habitat disturbance	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High
		Erosion and sedimentation of wetlands	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High
		Altered drainage and hydrological connectivity	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High
		Hydrocarbon and construction-related contamination risk	HGM 3, HGM 7 - 8, HGM 11 - 12	**24**	**L**	High
		Soil compaction and wetland buffer degradation	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High
	Construction of Powerlines (Intersecting wetlands) Vegetation clearing, pole foundation excavation, structure installation, conductor stringing, and access along the powerline route	Wetland degradation	HGM 7 - 8, HGM 10	**32**	**M**	High
		Vegetation and habitat disturbance	HGM 7 - 8, HGM 10	**32**	**M**	High
		Erosion and sedimentation of wetlands	HGM 7 - 8, HGM 10	**24**	**L**	High
		Altered local drainage patterns	HGM 7 - 8, HGM 10	**24**	**L**	High
		Pollution from fuels, oils, and construction activities	HGM 7 - 8, HGM 10	**24**	**L**	High

		Disturbance to wetland fauna and soil compaction	HGM 7 - 8, HGM 10	32	M	High
OPERATIONAL	**Operation of TSF (Deelkraal II TSF) (Within 500 m of wetlands and within 100 m of drainage features)** Tailings deposition and storage, return water management, stormwater management, embankment and facility maintenance, erosion and dust control, monitoring activities, and operational vehicle movement.	Vegetation, habitat disturbance and alien proliferation	HGM 1 - 16	24	L	High
		Erosion and sedimentation of wetlands	HGM 1 - 16	24	L	High
		Altered surface flow and wetland hydrology	HGM 1 - 16	24	L	High
		Polluted runoff and spill risk	HGM 1 - 16	24	L	High
		Dust and disturbance to wetland fauna	HGM 1 - 16	24	L	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	18	L	High
	Operation of Pipelines (slurry, process water and potable water pipelines) (Within 500 m of wetlands and within 100 m of drainage features) Conveyance of slurry, process water and potable water, routine inspection and maintenance, pumping and flow control, leak detection and repair where required, vegetation management within servitudes, and operational access along pipeline servitudes and alignments.	Vegetation, habitat disturbance and alien proliferation	HGM 1 - 16	7.2	L	High
		Erosion and sedimentation of wetlands	HGM 1 - 16	7.2	L	High
		Altered drainage and hydrological connectivity	HGM 1 - 16	7.2	L	High
		Leakage and operational-related contamination risk	HGM 1 - 16	7.2	L	High
		Soil compaction and wetland buffer degradation	HGM 1 - 16	7.2	L	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	5.4	L	High
	Operation of Powerlines (Within 500 m of wetlands and within 100 m of drainage features) Transmission and distribution of power, routine inspection and maintenance of powerline infrastructure, vegetation management within the servitude, repair works where required, and operational access along the powerline route.	Vegetation, habitat disturbance and alien proliferation	HGM 1 - 16	7.2	L	High
		Erosion and sedimentation of wetlands	HGM 1 - 16	7.2	L	High
		Altered local drainage patterns	HGM 1 - 16	7.2	L	High
		Pollution from fuels, oils, and maintanance activities	HGM 1 - 16	7.2	L	High
		Disturbance to wetland fauna and soil compaction	HGM 1 - 16	7.2	L	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	5.4	L	High
	Operation of TSF (Deelkraal II TSF) (Intersecting wetlands and drainage features) Tailings deposition and storage, return water management, stormwater management, embankment and facility maintenance, erosion and dust	Wetland degradation	HGM 1 - 6	64	H	High
		Vegetation, habitat disturbance and alien proliferation	HGM 1 - 6	64	H	High
		Erosion and sedimentation of wetlands	HGM 1 - 6	64	H	High

	control, monitoring activities, and operational vehicle movement.	Altered surface flow and wetland hydrology	HGM 1 - 6	**64**	**H**	High
		Polluted runoff and spill risk	HGM 1 - 6	**64**	**H**	High
		Dust and disturbance to wetland fauna	HGM 1 - 6	**64**	**H**	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	**48**	**M**	High
	Operation of Pipelines (slurry, process water and potable water pipelines) (Intersecting wetlands) Conveyance of slurry, process water and potable water, routine inspection and maintenance, pumping and flow control, leak detection and repair where required, vegetation management within servitudes, and operational access along pipeline servitudes and alignments.	Wetland degradation	HGM 3, HGM 7 - 8, HGM 11 - 12	**38.4**	**M**	High
		Vegetation, habitat disturbance and alien proliferation	HGM 3, HGM 7 - 8, HGM 11 - 12	**38.4**	**M**	High
		Erosion and sedimentation of wetlands	HGM 3, HGM 7 - 8, HGM 11 - 12	**38.4**	**M**	High
		Altered drainage and hydrological connectivity	HGM 3, HGM 7 - 8, HGM 11 - 12	**38.4**	**M**	High
		Leakage and operational-related contamination risk	HGM 3, HGM 7 - 8, HGM 11 - 12	**28.8**	**L**	High
		Soil compaction and wetland buffer degradation	HGM 3, HGM 7 - 8, HGM 11 - 12	**38.4**	**M**	High
	Operation of Powerlines (Intersecting wetlands) Transmission and distribution of power, routine inspection and maintenance of powerline infrastructure, vegetation management within the servitude, repair works where required, and operational access along the powerline route.	Wetland degradation	HGM 7 - 8, HGM 10	**38.4**	**M**	High
		Vegetation, habitat disturbance and alien proliferation	HGM 7 - 8, HGM 10	**38.4**	**M**	High
		Erosion and sedimentation of wetlands	HGM 7 - 8, HGM 10	**28.8**	**L**	High
		Altered local drainage patterns	HGM 7 - 8, HGM 10	**28.8**	**L**	High
		Pollution from fuels, oils, and maintanance activities	HGM 7 - 8, HGM 10	**28.8**	**L**	High
		Disturbance to wetland fauna and soil compaction	HGM 7 - 8, HGM 10	**38.4**	**M**	High
DECOMMISSIONING	**Decommissioning of TSF (Deelkraal II TSF) (Within 500 m of wetlands and within 100 m of drainage features)** Site decommissioning, dismantling and removal of associated infrastructure, reshaping and stabilisation of embankments/platforms, reconfiguration of stormwater controls where required, topsoil replacement, rehabilitation and revegetation, and decommissioning vehicle movement.	Vegetation and habitat disturbance	HGM 1 - 16	**24**	**L**	High
		Erosion and sedimentation of wetlands	HGM 1 - 16	**24**	**L**	High
		Altered surface flow and wetland hydrology	HGM 1 - 16	**24**	**L**	High
		Polluted runoff and spill risk	HGM 1 - 16	**24**	**L**	High
		Dust and disturbance to wetland fauna	HGM 1 - 16	**24**	**L**	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	**18**	**L**	High

	Decommissioning of Pipelines (slurry, process water and potable water pipelines) (Within 500 m of wetlands and within 100 m of drainage features) Pipeline isolation, draining and flushing where required, removal of pipelines and associated infrastructure or approved abandonment in situ, removal of plinths/crossing infrastructure where required, backfilling and re-contouring of disturbed areas, rehabilitation of servitudes, and decommissioning access along pipeline servitudes and alignments.	Vegetation and habitat disturbance	HGM 1 - 16	**11.2**	**L**	High
		Erosion and sedimentation of wetlands	HGM 1 - 16	**11.2**	**L**	High
		Altered drainage and hydrological connectivity	HGM 1 - 16	**11.2**	**L**	High
		Hydrocarbon and demolition-related contamination risk	HGM 1 - 16	**11.2**	**L**	High
		Soil compaction and wetland buffer degradation	HGM 1 - 16	**11.2**	**L**	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	**8.4**	**L**	High
	Decommissioning of Powerlines (Within 500 m of wetlands and within 100 m of drainage features) Vegetation clearing where required for access, conductor and structure removal, excavation and removal of pole foundations where required, rehabilitation of disturbed areas, and decommissioning access along the powerline route.	Vegetation and habitat disturbance	HGM 1 - 16	**11.2**	**L**	High
		Erosion and sedimentation of wetlands	HGM 1 - 16	**11.2**	**L**	High
		Altered local drainage patterns	HGM 1 - 16	**11.2**	**L**	High
		Pollution from fuels, oils, and demolition activities	HGM 1 - 16	**11.2**	**L**	High
		Disturbance to wetland fauna and soil compaction	HGM 1 - 16	**11.2**	**L**	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	**8.4**	**L**	High
	Decommissioning of TSF (Deelkraal II TSF) (Intersecting wetlands and drainage features) Site decommissioning, dismantling and removal of associated infrastructure, reshaping and stabilisation of embankments/platforms, reconfiguration of stormwater controls where required, topsoil replacement, rehabilitation and revegetation, and decommissioning vehicle movement.	Wetland degradation	HGM 1 - 6	**64**	**H**	High
		Vegetation and habitat disturbance	HGM 1 - 6	**64**	**H**	High
		Erosion and sedimentation of wetlands	HGM 1 - 6	**64**	**H**	High
		Altered surface flow and wetland hydrology	HGM 1 - 6	**64**	**H**	High
		Polluted runoff and spill risk	HGM 1 - 6	**64**	**H**	High
		Dust and disturbance to wetland fauna	HGM 1 - 6	**64**	**H**	High
		Altered hydrology and geomorphology of non-perennial drainage	Non-perennial drainage	**48**	**M**	High
	Decommissioning of Pipelines (slurry, process water and potable water pipelines) (Intersecting wetlands) Pipeline isolation, draining and flushing where required, removal of pipelines and	Wetland degradation	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High
		Vegetation and habitat disturbance	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High
		Erosion and sedimentation of wetlands	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High

	associated infrastructure or approved abandonment in situ, removal of plinths/crossing infrastructure where required, backfilling and re-contouring of disturbed areas, rehabilitation of servitudes, and decommissioning access along pipeline servitudes and alignments.	Altered drainage and hydrological connectivity	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High
		Hydrocarbon and demolition-related contamination risk	HGM 3, HGM 7 - 8, HGM 11 - 12	**24**	**L**	High
		Soil compaction and wetland buffer degradation	HGM 3, HGM 7 - 8, HGM 11 - 12	**32**	**M**	High
	Decommissioning of Powerlines (Intersecting wetlands) Vegetation clearing where required for access, conductor and structure removal, excavation and removal of pole foundations where required, rehabilitation of disturbed areas, and decommissioning access along the powerline route.	Wetland degradation	HGM 7 - 8, HGM 10	**32**	**M**	High
		Vegetation and habitat disturbance	HGM 7 - 8, HGM 10	**32**	**M**	High
		Erosion and sedimentation of wetlands	HGM 7 - 8, HGM 10	**24**	**L**	High
		Altered local drainage patterns	HGM 7 - 8, HGM 10	**24**	**L**	High
		Pollution from fuels, oils, and demolition activities	HGM 7 - 8, HGM 10	**24**	**L**	High
		Disturbance to wetland fauna and soil compaction	HGM 7 - 8, HGM 10	**32**	**M**	High

4.3 Impact Assessment

The proposed development has the potential to result in localised, and in some instances significant, disturbance to freshwater habitat, particularly within wetlands HGM 1–8 and HGM 10–12, as well as non-perennial drainage, where these features are intersected by the current project layout.

The proposed pipeline and powerline components do not require extensive direct infrastructure placement within delineated wetland footprints and, in some areas, follow existing road corridors. These components may nevertheless result in indirect impacts if not appropriately managed. Such impacts can largely be reduced through the micro-siting of linear infrastructure outside wetland buffers and, where crossings are unavoidable, by spanning wetland buffer areas or otherwise minimising the disturbance footprint.

By contrast, the proposed reclamation areas, laydown areas, stockpile areas and associated plant infrastructure, including the pump station, intersect wetlands, the non-perennial drainage line and their associated buffers, and would therefore require repositioning to avoid these sensitive areas. Most notably, the current TSF footprint would result in the complete loss of HGM 1, HGM 2 and HGM 4, and substantial loss of HGM 3, HGM 5 and HGM 6, as well as sections of non-perennial drainage. The TSF layout should therefore be redesigned to avoid these freshwater features as far as practicable; where such avoidance is not achievable, priority should be given to the rehabilitation of the remaining intact and connected freshwater systems affected by the development, with offsetting considered only as a last resort for unavoidable residual impacts.

The impacts associated with the proposed activities were assessed using the EIMS impact matrix, and the results are presented in Table 4-2, with the detailed assessment provided in Appendix B. The assessment considers the anticipated impacts associated with the construction, operational and decommissioning phases of the proposed project. The findings indicate that impacts associated with the linear infrastructure and mining plant infrastructure components are generally of low to moderate significance prior to mitigation and can be reduced to low significance post-mitigation, provided that the recommended mitigation measures and prescribed buffer requirements are implemented. In contrast, impacts associated with the TSF development are of high significance prior to mitigation and, even with

mitigation, are anticipated to remain of medium to high significance unless the layout is redesigned to avoid sensitive freshwater features as far as practicable and, where residual impacts cannot be avoided, priority is given to the rehabilitation of the remaining intact and connected freshwater systems, with offset measures considered only as a last resort.

Table 4-2 Summative results of the EIMS Impact Assessment conducted for the proposed project

Identifier	Impact	Phase	Pre-Mitigation Significance Score	Pre-Mitigation Significance	Post-mitigation Significance Score	Post-Mitigation Significance	Final score	Final Significance
Wet01	Indirect loss, disturbance and degradation of wetlands	Construction	-4.5	Medium to low -	-3	Low -	-3.75	Low -
Wet02	Increased bare surfaces, runoff and potential for erosion	Construction	-6.75	Medium to low -	-4	Low -	-5.00	Medium to low -
Wet03	Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation	Construction	-6.75	Medium to low -	-3.5	Low -	-4.38	Medium to low -
Wet04	Increased sediment loads to downstream reaches	Construction	-6.75	Medium to low -	-3.5	Low -	-4.38	Medium to low -
Wet05	Contamination of wetlands with hydrocarbons due to machinery leaks and eutrophication of wetland systems with human sewerage and other waste	Construction	-6.75	Medium to low -	-3.5	Low -	-4.38	Medium to low -
Wet06	Alteration of hydrological regime	Construction	-6	Medium to low -	-3	Low -	-3.75	Low -
Wet07	Degradation and demolition of wetlands due to TSF and intersecting infrastructure	Construction	-18.75	High -	-13	Medium to high -	-19.50	High -
Wet08	Increased water and pollutant inputs to wetlands	Operation	-6.75	Medium to low -	-3.5	Low -	-4.38	Medium to low -
Wet09	Alteration of hydrological regime and sediment loads to downstream reaches	Operation	-6.75	Medium to low -	-3.5	Low -	-4.38	Medium to low -
Wet10	Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation	Operation	-6.75	Medium to low -	-3.5	Low -	-4.38	Medium to low -
Wet11	Degradation and demolition of wetlands due to TSF and intersecting infrastructure	Operation	-18.75	High -	-13	Medium to high -	-19.50	High -
Wet12	Degradation of wetland vegetation and proliferation of alien and invasive species	Decommissioning	-6.75	Medium to low -	-3.5	Low -	-4.38	Medium to low -
Wet13	Disruption of wetland soil profile, hydrological regime and increased sediment loads	Decommissioning	-6.75	Medium to low -	-3.5	Low -	-4.38	Medium to low -

5 Mitigation Measures

In light of the expected impacts from proposed activities the following mitigation measures have been proposed to lower the intensity of the impacts on the ecological integrity of the wetland catchment and its downslope wetland features (Table 5-1).

Given the surrounding ridges, existing infrastructure, limited available land and the constrained opportunity to materially shift major infrastructure components, the mitigation strategy should focus on

practicable impact minimisation, strict control of disturbance, and rehabilitation of the remaining impacted and hydrologically connected wetland systems.

The focus of mitigation measures should be to reduce the significance of potential environmental impacts associated with the proposed reclamation project and thereby to:

- Prevent the unnecessary destruction of, and fragmentation, of the vegetation community of the wetland areas; and

- Limit the construction area to the defined project areas and only impact those areas where it is unavoidable to do so otherwise.

The key management focus areas specific to the identified impacts include:

- Minimise direct disturbance to and encroachment into wetlands, drainage features and their buffers where practicable by refining the layout and micro-siting those components for which some flexibility remains, including the reclamation pump station, access arrangements, stockpile areas and other ancillary infrastructure where feasible, while recognising that certain infrastructure elements are location-constrained. Where impacts cannot be avoided, the disturbance footprint should be kept to the minimum practicable extent and supported by targeted rehabilitation of the residual and connected wetland systems, particularly HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas;

- Recognise that certain major components, including the TSF footprint and the existing return water dam to be upgraded and lined, have limited scope for relocation, and therefore require robust containment, stormwater and pollution control measures;

- Prioritise the rehabilitation of remaining impacted and hydrologically connected wetland systems, drainage features and buffer areas in order to improve ecological function and reduce cumulative degradation;

- Manage the return water dam, which is an existing facility to be upgraded and lined, as a contained system with appropriate seepage control, clean and dirty water separation, stormwater management and erosion protection;

- Limit the disturbance footprint and phase the reclamation works so that the minimum practicable area is exposed at any one time. Reclamation, construction and ancillary works must be sequenced to reduce bare ground, erosion risk and prolonged habitat disturbance.

- Maintain hydrological and geomorphological continuity at all drainage and wetland crossings by using appropriately designed crossings, above-ground pipeline supports outside active flow paths where feasible, and immediate reinstatement of bed and bank form where disturbance cannot be avoided.

- Implement strict stormwater, erosion, and sediment control measures around the TSF footprint, return water dam, pipeline corridors, roads, stockpiles, and plant upgrade areas so that sediment-laden runoff does not enter wetlands or downstream drainage lines.

- Separate clean and dirty water systems and ensure that slurry, return water and other contaminated water are fully contained within the designed system. No dirty water, seepage, sewage, hydrocarbons or waste may be allowed to enter wetlands or drainage features.

- Manage topsoil and wetland-related soils carefully by stripping separately, stockpiling outside sensitive areas, preventing compaction and contamination, and replacing soils in the correct order during rehabilitation.

- Restrict vehicles, plant and personnel to demarcated work areas and approved access routes only, with no ad hoc tracks, turning areas, laydown areas or stockpiles in wetland buffers.

- Implement progressive rehabilitation of completed sections of disturbance as soon as they become available, including regrading, decompaction, topsoil replacement, revegetation with indigenous species and alien invasive plant control.

- Control indirect ecological disturbance by limiting unnecessary vegetation clearing, managing dust, preventing fauna entrapment in excavations, limiting lighting spill into wetland areas and maintaining good housekeeping throughout all phases.

- Monitor, audit and adapt the mitigation measures throughout construction, operation and decommissioning so that any erosion, pollution, hydrological alteration or rehabilitation failure is corrected early.

Table 5-1 Mitigation Measures and Monitoring and Management Outcomes

Identifier Reference	Mitigation Measure	Phase	Intended Management Outcome	Timeframe	Monitoring Frequency	Target	Monitoring Tool	Responsible Parties
Wet01, Wet06, Wet07, Wet11, Wet13	Refine the layout of those project components for which some flexibility remains to minimise direct disturbance to wetlands, drainage features and their buffers as far as practicable, while recognising that major infrastructure components such as the TSF footprint and return water dam are location-constrained. Peg and demarcate all approved disturbance footprints, no-go areas and retained wetland/buffer areas before site establishment. Where impacts cannot be avoided, limit the disturbance footprint to the minimum practicable extent and implement targeted rehabilitation of the residual and hydrologically connected wetland systems, particularly HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas.	Planning, Pre-construction, Construction	Direct wetland loss, fragmentation and disturbance are minimised as far as practicable, retained wetland and buffer areas are protected, and residual impacts are addressed through targeted rehabilitation of connected wetland systems.	During detailed design and before any clearing; maintained throughout construction	Once-off design sign-off; weekly during active works	No unapproved encroachment into delineated wetlands or approved buffers; 100% of no-go areas demarcated before works commence	Approved layout plans, pegging records, ECO inspection sheets, photographic record	Proponent, Design Engineer, Contractor, Site Manager, ECO
Wet01, Wet06, Wet09, Wet13	Design and construct all crossings of drainage features and wetland margins to maintain surface and shallow subsurface flow. Use above-ground pipelines on pre-cast plinths outside wetland beds and banks as far as practicable; span drainage lines where feasible; place supports	Design, Construction, Operation, Decommissioning	Hydrological connectivity and channel/wetland form are maintained and infrastructure does not cause ponding, diversion or scour.	Prior to crossing installation and throughout the life of the project	At installation; monthly during operation; after significant rainfall events and after maintenance works	No infrastructure-induced ponding, diversion, scour or erosion at crossings; 100% compliance with approved crossing method statements	Method statements, as-built drawings, crossing inspections, post-rainfall inspections, maintenance logs	Design Engineer, Contractor, Mine Engineer, Maintenance Team, ECO

	outside active flow paths; size culverts and crossings to pass storm flows; and - reinstate bed and bank profiles immediately after installation or maintenance works.							
Wet02, Wet04, Wet09, Wet13	Implement a stormwater, erosion and sediment control plan for the TSF footprint, return water dam, road verges, pipeline corridors, stockpiles and plant upgrade areas. Install cut-off drains, berms, silt traps, sediment barriers and energy dissipaters before major earthworks commence. Stabilise exposed slopes, protect stockpiles, prevent concentrated runoff, and repair erosion features immediately when they develop.	Pre-construction, Construction, Operation, Decommissioning	Sediment mobilisation is controlled and downstream wetland and drainage line sediment loading is minimised.	Before earthworks and maintained throughout all phases until closure criteria are met	Weekly during active earthworks; monthly during operation; after significant rainfall events	No uncontrolled sediment discharge to wetlands or drainage lines; no active rills or gullies left untreated	Stormwater plan, site inspections, rainfall records, maintenance register, photo monitoring	Contractor, Civil Engineer, Site Manager, Environmental Officer, ECO
Wet03, Wet10, Wet12, Wet13	Strip topsoil separately from subsoil in dry conditions, keep wetland-related soils separate from general fill, and stockpile all soils outside wetlands and approved buffers. Protect stockpiles from erosion, compaction and contamination. Replace soils in the correct order during rehabilitation and do not use wetland soils for berms, access roads or general fill.	Construction, Decommissioning, Rehabilitation	Soil structure, seedbank potential and rehabilitation potential are retained and unnecessary soil profile disturbance is avoided.	During all stripping, stockpiling and rehabilitation activities	Daily during stripping and replacement; monthly stockpile inspections	100% separate handling of topsoil and subsoil; no stockpiles located within wetland footprints or buffers	Soil handling records, stockpile inspection sheets, photographic record, ECO audits	Contractor, Site Manager, Rehabilitation Team, ECO
Wet05, Wet08	Store fuels, oils and chemicals in bunded areas outside wetland buffers; refuel and service plant only at designated areas on impermeable surfaces; provide drip trays and spill kits on mobile	Construction, Operation, Decommissioning	Wetlands and drainage features are protected from hydrocarbon,	Throughout all phases	Daily housekeeping inspections; monthly audits; immediately after any incident	Zero hydrocarbon, sewage or waste discharges to wetlands or drainage lines;	Spill register, waste disposal records, sewage removal records, housekeeping	Contractor, Operator, HSE Officer, Environmental Officer, ECO

	plant; collect sewage in sealed systems; remove waste regularly; and implement a spill response procedure that prevents contaminated water, hydrocarbons, sewage or waste from entering wetlands or drainage lines.		sewage and waste contamination.			100% of spills contained, cleaned up and recorded	inspections, incident reports	
Wet01, Wet02, Wet03, Wet04, Wet10, Wet12	Sequence reclamation and associated works so that the minimum practicable area of Deelkraal 1, Kusasalethu and the Deelkraal II construction footprint is disturbed at any one time. Confine vehicles, laydown areas, workshops, material storage and staff movement to approved footprints and existing or demarcated routes only. No ad hoc tracks, turning areas or stockpiles are permitted within wetland buffers. Apply speed limits near wetlands, manage dust on roads without causing runoff, and inspect open excavations daily with escape ramps where required.	Construction, Operation	Bare ground exposure, habitat disturbance, dust generation and indirect ecological disturbance are minimised.	Throughout active reclamation, construction and maintenance periods	Weekly, with daily checks during intensive earthworks	No unauthorised disturbance outside approved footprints; no ad hoc tracks in buffers; no excavations left unsafe for fauna	Approved disturbance maps, access control inspections, trench inspection sheets, photo monitoring, ECO audits	Contractor, Site Manager, Mine Operations Manager, ECO
Wet05, Wet06, Wet08	Maintain the TSF, return water dam and associated slurry and return water pipelines as contained systems. Inspect pipe joints, supports, valves and plinths; maintain freeboard and stormwater capacity; repair leaks immediately; keep return water infrastructure operational; and implement isolation and emergency shutdown procedures	Operation	Operational residue and water management infrastructure functions without causing contamination or hydrological degradation of wetlands.	Throughout operation	Daily operator inspections; monthly formal inspections; after storm events and after shutdowns	Zero uncontrolled releases to wetlands; freeboard maintained to design requirement; all leaks repaired within specified response time	Maintenance logs, inspection sheets, incident register, water balance/freeboard records, environmental audits	TSF Operator, Plant Manager, Maintenance Team, Environmental Manager

	where pipelines approach wetlands or drainage features. No overtopping, seepage breakout or dirty water discharge is permitted to wetland systems.							
Wet01, Wet02, Wet06, Wet09	Maintain roads, culverts, stormwater outlets and access routes so that runoff is dispersed and not concentrated into wetlands or drainage lines. Use existing access routes for inspection and maintenance as far as possible; do not blade material into drainage features; avoid maintenance works during saturated conditions; and reinstate any disturbed verges, side-cast or borrow areas immediately.	Operation, Decommissioning	Routine access and maintenance activities do not create secondary erosion, sedimentation or hydrological impacts.	Throughout operation and decommissioning	Monthly and after significant rainfall events	No blocked culverts; no side-cast or spoil in wetlands; no new erosion caused by access route maintenance	Road and culvert inspection forms, photo records, maintenance logs, ECO inspections	Maintenance Supervisor, Roads Contractor, Environmental Officer, ECO
Wet01, Wet03, Wet10, Wet12	Implement progressive rehabilitation of completed sections of the TSF footprint, pipeline corridors, temporary work areas, laydown areas and decommissioned infrastructure as soon as they become available. Rip compacted surfaces, regrade to stable contours, replace topsoil, re-establish indigenous vegetation appropriate to the receiving habitat, and implement an alien invasive species control programme until acceptable cover is achieved.	Construction, Operation, Decommissioning, Rehabilitation	Disturbed areas are stabilised early and ecological function is progressively restored while invasive species are suppressed.	Immediately after areas become available and maintained through establishment period	Monthly during active rehabilitation; quarterly during vegetation establishment	No untreated disturbed areas left beyond one rainy season where access is available; vegetation recovery achieved; alien cover controlled to acceptable threshold	Rehabilitation plans, vegetation monitoring plots, fixed-point photographs, alien clearing register, ECO audits	Contractor, Rehabilitation Specialist, Environmental Manager, ECO
Wet01, Wet02, Wet04, Wet05,	Undertake routine wetland and drainage line compliance inspections, post-rainfall audits and targeted water quality	All phases	Emerging impacts are identified early and corrected before significant	Throughout all phases	Weekly during construction; monthly during operation; after	100% of non-conformances recorded and closed out within	ECO audit reports, water quality records, photo monitoring, non-	ECO, Environmental Manager, Contractor,

Wet06, Wet08, Wet09, Wet13	monitoring at relevant downstream points. Record all non-conformances, implement corrective actions within defined timeframes, and adapt management measures where erosion, sedimentation, pollution, seepage or drainage disruption is recurring.		degradation occurs.		significant rainfall and all incidents; quarterly audits	agreed timeframe; repeat incidents show a declining trend	conformance register, corrective action log	Operator, Site Manager
Wet01, Wet02, Wet03, Wet04, Wet05, Wet06, Wet07, Wet08, Wet09, Wet10, Wet11, Wet12, Wet13	Prepare and implement a decommissioning and closure method statement for the removal of temporary infrastructure, decompaction of affected areas, re-establishment of drainage patterns, stabilisation of final landforms, rehabilitation of redundant roads and service corridors, and removal of all waste and contaminated material. Continue monitoring and maintenance until closure criteria for erosion control, pollution prevention and vegetation establishment are met.	Decommissioning, Rehabilitation, Post-closure	The post-closure landscape is stable, non-polluting and does not continue to degrade wetlands or drainage features.	Prior to decommissioning and maintained until closure sign-off	Once-off planning; weekly during decommissioning; quarterly post-closure until sign-off	All temporary infrastructure removed; no active erosion or pollution sources remain; rehabilitation and closure criteria achieved	Closure plan, decommissioning inspection sheets, rehabilitation monitoring reports, photo records, sign-off documentation	Closure Contractor, Mine Closure Manager, Environmental Manager, ECO

6 Recommendations

Based on the findings of the wetland delineation, impact assessment and RAM, the proposed development is supportable from a freshwater perspective on a strictly conditional basis, subject to the rigorous implementation of the recommended mitigation, rehabilitation and monitoring measures. Given the surrounding ridges, existing infrastructure, limited available land and the constrained opportunity to materially shift major infrastructure components, the primary mitigation focus should be on minimising the disturbance footprint as far as practicable, micro-siting those components for which some flexibility remains, and managing residual impacts through rehabilitation and long-term environmental control. In this regard, selected infrastructure such as the reclamation pump station, ancillary work areas, access arrangements and stockpile areas should, where feasible, be positioned outside delineated wetlands and their buffers, while major infrastructure elements such as the TSF footprint and return water dam are recognised to be largely location-constrained.

The linear infrastructure and associated plant components may be considered acceptable in principle, provided that disturbance is limited to the minimum practicable extent, crossings are restricted to the smallest feasible footprint, hydrological and geomorphological continuity is maintained, and all stormwater, erosion, sediment and pollution control measures are effectively implemented. All relevant crossings, as well as wetlands that will be directly impacted and/or lost, should be addressed through the applicable water use authorisation process, and the project-specific EMPr should include clear method statements and monitoring requirements for all activities in proximity to wetlands and drainage features.

For the TSF component, the residual freshwater impact remains substantial due to the extent of direct wetland loss and disturbance within the footprint. Where further avoidance is not reasonably achievable, mitigation should focus on strict disturbance control, containment of dirty water, protection of retained wetland and buffer areas, and targeted rehabilitation of the remaining impacted and hydrologically connected freshwater systems. This should focus particularly on the residual and adjoining portions of HGM 3, HGM 5 and HGM 6, together with associated drainage and buffer areas, and where feasible other degraded connected wetland areas that can be improved through active restoration.

Rehabilitation should be implemented progressively where areas become available and should, as far as practicable, include:

- Removal of temporary disturbance, redundant fill, and unnecessary berms or flow obstructions outside the approved permanent footprint;
- Regrading and stabilisation of disturbed areas to reinstate suitable surface form and prevent erosion;
- Reinstatement of diffuse surface flow and shallow subsurface connectivity where these have been disrupted;
- Separate handling and replacement of suitable topsoil and wetland-related soils in the correct profile sequence;
- Revegetation with locally indigenous wetland and riparian species appropriate to the relevant hydrogeomorphic setting;
- Control of alien and invasive plant species and prevention of further disturbance by vehicles or uncontrolled access; and
- Monitoring of erosion, vegetation establishment, hydrological response and overall rehabilitation performance, with adaptive intervention where required.

All works in proximity to wetlands and drainage features should be overseen by a suitably qualified Environmental Control Officer, with targeted freshwater specialist input where design refinements, wetland verification, rehabilitation planning or corrective actions are required. Rehabilitation performance should be reviewed over time to confirm that disturbed areas are stabilising, wetland vegetation is establishing, and no ongoing erosion, pollution or drainage disruption is occurring. Where residual wetland loss remains unavoidable after minimisation and rehabilitation measures have been applied, offsetting may be considered only as a measure of last resort.

7 Conclusion

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

A summary of the ecological assessment results, including Present Ecological State (PES), Ecological Importance and Sensitivity (EIS), ecosystem service provision, recommended ecological category / resource management objective (REC/RMO) and buffer requirements, are provided in Table 7-1.

Table 7-1 Ecological characteristics and buffer requirements of the freshwater features

HGM Unit / Feature	PES	EIS	Ecosystem Services	REC - RMO	Buffer Requirement
HGM 1, 3, 5–6, 11–12, 15–16	E – Seriously Modified	High	Moderate	E/F – Improve	25 m
HGM 2, 14	E – Seriously Modified	High	Moderately Low	E/F – Improve	25 m
HGM 4	D – Largely Modified	High	Moderately Low	C/D – Improve	25 m
HGM 7, 10	D – Largely Modified	High	Moderately High	C/D – Improve	25 m
HGM 8	E – Seriously Modified	High	Moderately High	E/F – Improve	25 m
HGM 9, 13	D – Largely Modified	High	Moderate	C/D – Improve	25 m
Non-perennial drainage	N/A	N/A	N/A	N/A	15 m

The National Environmental Screening Tool identified the mapped wetlands as having Very High aquatic biodiversity sensitivity, with other remaining areas in the proposed project site classified as Low sensitivity. Based on field and desktop verification, the specialist assessment assigned a High / Very High sensitivity rating to the identified wetlands, taking into account the PES and EIS results and the functional role of these wetlands within the modified and disturbed mining landscape.

7.1 Risk Statement

A risk assessment was conducted for the proposed Harmony West Wits Reclamation Project. The risks to freshwater features associated with the linear infrastructure and associated plant components are generally anticipated to be low to moderate after mitigation, provided that disturbance is limited to the minimum practicable extent, crossings are carefully controlled, hydrological and geomorphological continuity is maintained, and the prescribed stormwater, erosion, sediment and pollution controls are fully implemented.

The proposed TSF component, however, remains associated with a substantial residual freshwater impact due to the extent of direct wetland loss and disturbance within the footprint, notwithstanding that the affected wetlands are already modified by existing mining-related disturbance. Given the limited scope to materially shift major infrastructure components, mitigation should focus on minimising the disturbance footprint as far as practicable, protecting retained wetland and buffer areas, and rehabilitating the remaining impacted and hydrologically connected wetland systems within the broader development area, particularly the residual and adjoining portions of HGM 3, HGM 5 and HGM 6,

together with associated drainage and buffer areas. Where residual wetland loss remains unavoidable after minimisation and rehabilitation measures have been applied, offsetting may be considered only as a measure of last resort.

Provided that the recommended mitigation, rehabilitation and monitoring measures are strictly implemented, the residual risks are considered manageable, and the proposed development may be regarded as acceptable for consideration by the competent authorities on a strictly conditional basis.

7.2 Specialist Opinion

Considering the assessment findings and the assumption that the recommended mitigation measures will be fully implemented, no fatal flaws are evident for the proposed project at this stage.

In the opinion of the specialist, and subject to strict adherence to the recommended mitigation measures, the project may be favourably considered for authorisation.

7.3 Layout Approval

An updated project layout has been received (Figure 7-1). In the opinion of the wetland specialist, the current layout is acceptable and can be considered for authorisation provided the mitigation measures of the EMPr are implemented.

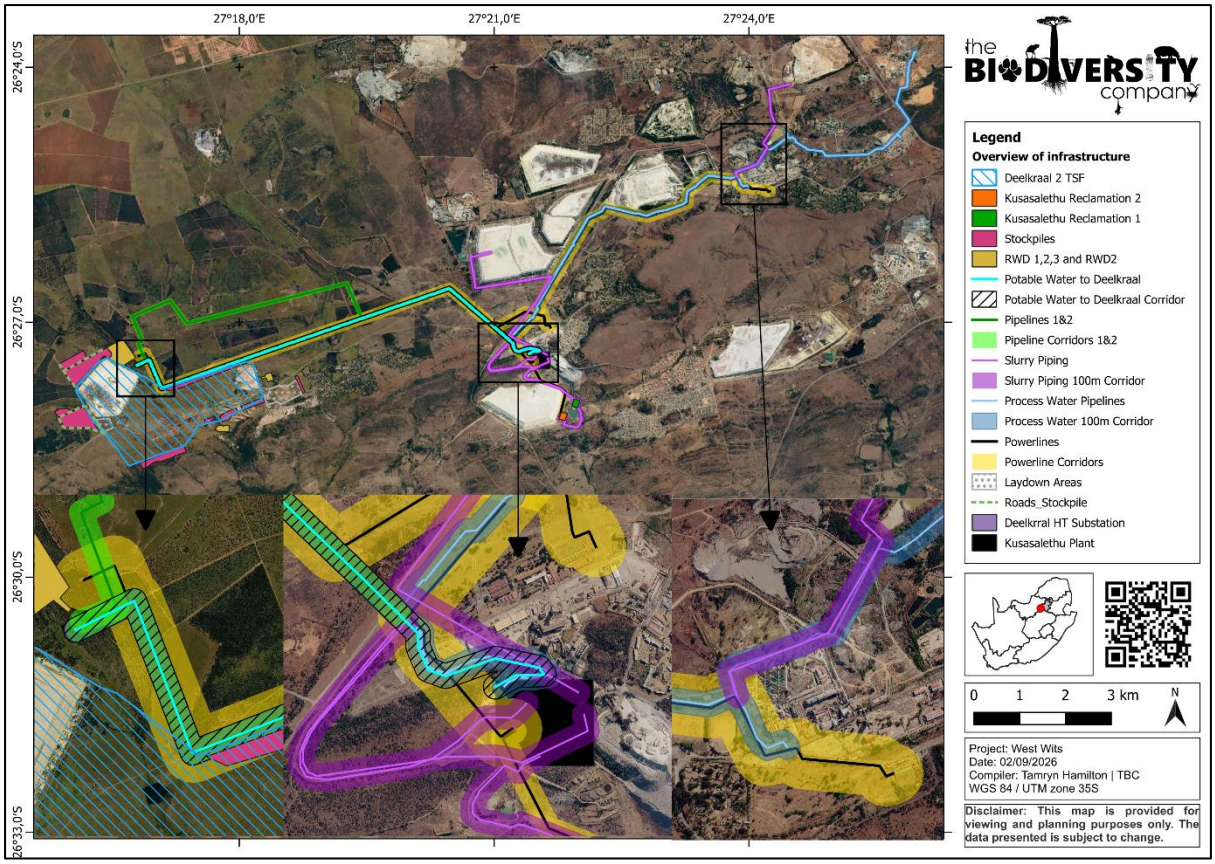


Figure 7-1 Updated layout for the proposed project

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9 Appendix Items

9.1 Appendix A – Methodology

9.1.1 Desktop Dataset Assessment

The desktop assessment was undertaken using Geographic Information System (GIS) to access, view and overlay the latest available related datasets with the project area. The information represented within the datasets was used to develop the relevant digital maps used to identify potentially environmentally sensitive areas. These datasets and their respective dates of publishing are provided below:

- Vegetation Types - Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018 & Mucina and Rutherford 2006);
- Soils and Geology - Land Types Database (Land Type Survey Staff, 1972 - 2006); and
- Topographical Inland Water Areas and River Lines (based on the 1994 1:500 000 topographic maps as per the Chief Directorate of the National Geo-spatial Information).

9.1.1.1 Vegetation Types - Vegetation Map of South Africa, Lesotho and Swaziland

The Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018) is the latest and updated version of the maps published in earlier time such as those presented by Mucina and Rutherford (2006) and those presented in the National Biodiversity Assessment (2011). The map provides spatial details on the representative vegetation of South Africa and is complemented in this report using information from Strelitzia (Mucina & Rutherford, 2006) to provide insight on the landscape features, biogeography, climate, geology, and soils of the project area.

9.1.1.2 Soils and Geology - Land Type Database

The Land Type Survey provides information on the soils, terrain, climate, and geology of areas within South Africa. The data includes the pedological classification of soils and is used in this report to provide insight on the common soil forms associated with aquatic or freshwater systems of a particular area.

9.1.1.3 Topographical River Lines and Inland Water Areas

Topographical Inland Water Areas and River Lines for South Africa are based on the topographic maps dated 1994 as per the National Geo-spatial Information. These datasets are used in this report to provide insight on potential wetland areas and serves to highlight the location and extent of drainage features, dams, wetlands, reservoirs and other relevant inland waterbodies.

9.1.1.4 Ecologically Important Landscape Features

The datasets listed below were incorporated to establish the relation between the project and ecologically important or sensitive freshwater entities. Emphasis was placed around the following spatial datasets:

- South African Inventory of Inland Aquatic Ecosystems (SAIIAE), NBA 2018 Rivers and Wetlands (Van Deventer *et al.,* 2019);
- National Freshwater Priority Areas, Rivers and Wetlands, 2011 (Nel *et al.,* 2011); and
- Strategic Water Source Areas, 2021 (Lötter & Le Maitre, 2021).

9.1.1.4.1 The South African Inventory of Inland Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the 2018 NBA, the SAIIAE is a collection of spatial data layers that represent the extent of river and inland wetland ecosystem types as well as the pressures on these systems. The same two headline indicators, and their associated categorisations, are applied with the terrestrial ecosystem NBA, namely Ecosystem Threat Status and Ecosystem Protection Level. The Ecosystem Threat Status of river and wetland ecosystem types are based on the extent to which each ecosystem type had been altered from its natural condition.

9.1.1.4.2 National Freshwater Ecosystem Priority Areas, Rivers and Wetlands

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its inland aquatic systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs). The FEPAs are intended to be conservation support tools and it is envisioned that they will guide the effective implementation of measures to achieve the National Environment Management: Biodiversity Act's biodiversity conservation goals (Nel *et al.,* 2011).

9.1.1.4.3 Strategic Water Source Areas

SWSAs are defined as areas of land that supply a disproportionate quantity of mean annual surface water runoff in relation to their size, and therefore contribute considerably to the overall water supply of the country, as well as national aquatic and terrestrial biodiversity resources. These are considered key ecological infrastructure assets and the effective protection of SWSAs is vital for national security because a lack of water security will compromise national security and human wellbeing on all levels.

9.1.2 Wetland Field Survey

9.1.2.1 Identification and Mapping

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 9-1. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
- The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

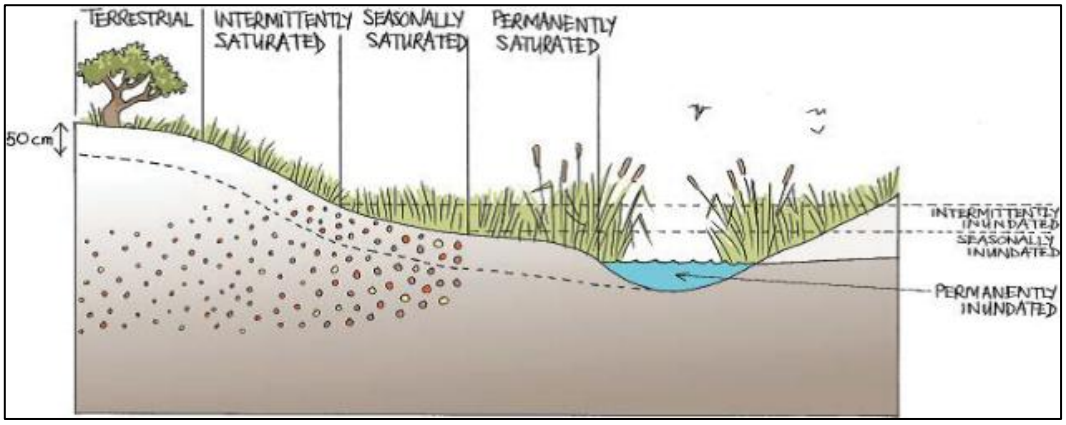


Figure 9-1 Cross section of a wetland, indicating how the soil wetness and vegetation indicators respond to changes in topography (Ollis et al. 2013)

9.1.2.2 Delineation

The wetland indicators described above are used to determine the boundaries of the wetlands within the project area. These delineations are then illustrated by means of maps accompanied by descriptions.

9.1.2.3 Classification and Description

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and then also includes structural features at the lower levels of classification (Ollis *et al.,* 2013).

9.1.3 Wetland Functional and Ecological Assessment

9.1.3.1 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands as well as humans. Eco Services serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al.,* 2020). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 9-1).

Table 9-1 The Importance categories assigned to the benefits (Kotze et al. 2020)

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.

Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

9.1.3.2 Present Ecological Status

The overall approach as described by Macfarlane *et al.,* 2020, is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (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 Present State categories are provided in Table 9-2.

Table 9-2 The Present Ecological Status categories (Macfarlane et al., 2007)

Impact Category	Description	Impact Score Range	PES
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

9.1.3.3 Ecological Importance and Sensitivity

The importance and sensitivity of water resources is determined in order establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants as described by Rountree *et al.,* 2013, is used to assign the Ecological Importance and Sensitivity (EIS) category as listed in Table 9-3.

Table 9-3 Description of Ecological Importance and Sensitivity categories

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	A
High	2.1 to 3.0	B
Moderate	1.1 to 2.0	C
Low Marginal	< 1.0	D

9.1.3.4 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) (Table 9-4) was determined based on the results obtained from the PES and EIS of the assessed wetlands, with the objective of recommending how a water resource should be managed. This is achieved by either maintaining or improving the ecological integrity of the wetland in order to ensure continued ecological functionality (DWA, 1999).

Table 9-4 Recommended Ecological Category and Recommended Management Objectives for water resources based on Present Ecological State and Ecological Importance and Sensitivity scores

PES		Ecological Importance and Sensitivity			
		Very High	*High*	*Moderate*	*Low*

	A (Pristine)	A Maintain	A Maintain	A Maintain	A Maintain
	B (Natural)	A Improve	A/B Improve	B Maintain	B Maintain
	C (Good)	A Improve	B/C Improve	C Maintain	C Maintain
	D (Fair)	C Improve	C/D Improve	D Maintain	D Maintain
	E/F (Poor)	D Improve	E/F Improve	E/F Maintain	E/F Maintain

9.1.4 Buffer Requirements

The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane *et al.,* 2014) was used to determine the appropriate buffer zone for the proposed activity.

9.1.5 Site Sensitivity Verification

The baseline aquatic / freshwater sensitivity of the project area was obtained using the National Web-based Environmental Screening Tool (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended). The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas based on the specialist assigned Ecological Importance and Sensitivity of the different systems (where applicable), with consideration been given to the presence of observed or likely sensitive fauna and flora.

9.2 Appendix B – Risk and Impact Assessment

9.2.1 Risk Assessment

The Department of Water and Sanitation (DWS) risk matrix assesses impacts in terms of consequence and likelihood. The significance of the impact is rated according to the classes presented in Table 9-5.

Table 9-5 Significance ratings matrix

Rating	Class	Management Description
1 – 29	(L) Low Risk	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
30 – 60	(M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
61 – 100	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

9.2.2 EIMS Risk Assessment

The EIMS impact assessment assesses impacts in terms of consequence and likelihood. The full results of the impacts are presented in Table 9-6.

Table 9-6 EIMS Risk Assessment Results

Identifier	Discipline	Impact	Alternative	Phase	Event	Pre-Nature	Pre-Extent	Pre-Duration	Pre-Magnitude	Pre-Reversibility	Consequence	Pre-Probability	Pre-Mitigation Significance Score	Pre-Mitigation Significance	Post-Nature	Post-Extent	Post-Duration	Post-Magnitude	Post-Reversibility	Consequence2	Post-Probability	Post-mitigation Significance Score	Post-Mitigation Significance	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score	Final Significance
Wet01	Aquatic/wetlands	Indirect loss, disturbance and degradation of wetlands		Construction	Normal operations or events	-1	1	1	2	2	-1.5	3	-4.5	Medium to low -	-1	1	1	2	2	-1.5	2	-3	Low -	High	2	2	1.25	-3.75	Low -
Wet02	Aquatic/wetlands	Increased bare surfaces, runoff and potential for erosion		Construction	Normal operations or events	-1	3	2	2	2	-2.25	3	-6.75	Medium to low -	-1	3	1	2	2	-2	2	-4	Low -	High	2	2	1.25	-5.00	Medium to low -
Wet03	Aquatic/wetlands	Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation		Construction	Normal operations or events	-1	3	2	2	2	-2.25	3	-6.75	Medium to low -	-1	2	1	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -
Wet04	Aquatic/wetlands	Increased sediment loads to downstream reaches		Construction	Normal operations or events	-1	3	2	2	2	-2.25	3	-6.75	Medium to low -	-1	2	1	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -

Wet05	Aquatic/wetlands	Contamination of wetlands with hydrocarbons due to machinery leaks and eutrophication of wetland systems with human sewerage and other waste		Construction	Normal operations or events	-1	3	2	2	2	-2.25	3	-6.75	Medium to low -	-1	2	1	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -
Wet06	Aquatic/wetlands	Alteration of hydrological regime		Construction	Normal operations or events	-1	3	1	2	2	-2	3	-6	Medium to low -	-1	1	1	2	2	-1.5	2	-3	Low -	High	2	2	1.25	-3.75	Low -
Wet07	Aquatic/wetlands	Degradation and demolition of wetlands due to TSF and intersecting infrastructure		Construction	Abnormal or unplanned events	-1	3	4	4	4	-3.75	5	-18.75	High -	-1	2	4	4	3	-3.25	4	-13	Medium to high -	High	3	3	1.50	-19.50	High -
Wet08	Aquatic/wetlands	Increased water and pollutant inputs to wetlands		Operation	Normal operations or events	-1	3	2	2	2	-2.25	3	-6.75	Medium to low -	-1	2	1	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -
Wet09	Aquatic/wetlands	Alteration of hydrological regime and sediment loads to downstream reaches		Operation	Normal operations or events	-1	3	2	2	2	-2.25	3	-6.75	Medium to low -	-1	2	1	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -
Wet10	Aquatic/wetlands	Degradation of wetland vegetation and the introduction and spread		Operation	Normal operations or events	-1	3	2	2	2	-2.25	3	-6.75	Medium to low -	-1	2	1	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -

		of alien and invasive vegetation																												
Wet11	Aquatic/wetlands	Degradation and demolition of wetlands due to TSF and intersecting infrastructure		Operation	Abnormal or unplanned events	-1	3	4	4	4	-3.75	5	-18.75	High -	-1	2	4	4	3	-3.25	4	-13	Medium to high -	High	3	3	1.50	-19.50	High -
Wet12	Aquatic/wetlands	Degradation of wetland vegetation and proliferation of alien and invasive species		Decommissioning	Normal operations or events	-1	3	2	2	2	-2.25	3	-6.75	Medium to low -	-1	2	1	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -
Wet13	Aquatic/wetlands	Disruption of wetland soil profile, hydrological regime and increased sediment loads		Decommissioning	Normal operations or events	-1	3	2	2	2	-2.25	3	-6.75	Medium to low -	-1	2	1	2	2	-1.75	2	-3.5	Low -	High	2	2	1.25	-4.38	Medium to low -

9.3 Appendix C – Specialist Declaration of Independence Declaration

I, Divan van Rooyen, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.



Divan van Rooyen

Ecologist

The Biodiversity Company

June 2026

9.4 Appendix D – Specialist CVs

Divan Van Rooyen



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PROFILE SUMMARY

Divan van Rooyen is an aquatic ecologist (Pri. Sci. Nat. 151272) with 4 years of experience in wetland identification and delineations. Divan completed his Ph.D. in environmental science at the North-West University Potchefstroom Campus. Divan has been part of wetland studies for seismic surveys, battery energy storage systems, renewable energy (wind and solar) and bulk services infrastructure development and part of aquatic biomonitoring studies for WWTW's and Mines.

PERSONAL INFO

Nationality: South African

Date of birth: 20 December 1993

EXPERIENCE

Environmental Impact Assessments (EIA)

Environmental Management Programmes (EMP)

Project Management

SKILLS

- ✓ Wetland functional assessments
- ✓ Ecology
- ✓ Rehabilitation
- ✓ Aquatic Biomonitoring
- ✓ Monitoring & Management Plans

LANGUAGES

English – Proficient

Afrikaans – Proficient



Signed: Divan van Rooyen

ACADEMIC QUALIFICATIONS

North-West University of Potchefstroom (2022): DOCTOR OF PHILOSPHY (PhD) – Environmental Science (Aquatic Ecosystem Health):
Title: The role of the Usuthu River as refuge for the aquatic biodiversity of the lower Phongolo floodplain system

North-West University of Potchefstroom (2018): MASTER OF SCIENCE (MSc) – Environmental Science:
Title: Ecotoxicity of CdTe and its functional groups on *Enchytraeus albidus*

North-West University of Potchefstroom (2015): HONOURS BACHELOR OF SCIENCE (Hons) – Environmental Science (Ecological Remediation and Sustainable Management)

PROFESSIONAL EXPERIENCE

Mar 2024 – Present	**The Biodiversity Company** Freshwater Ecologist
Dec 2022 – Feb 2024	**Nitai Consulting** Aquatic and Environmental Consultant
Mar 2022 – Nov 2022	**Enviroworks** Aquatic and Environmental Consultant
Jan 2022 – Feb 2022	**ABS-Africa** Environmental Intern
Jan 2017 – Apr 2021	**North-West University** Research Assistant

INTERNATIONAL EXPERIENCE

South Africa