

**Aquatic Biodiversity Theme
Site Sensitivity Verification and
Compliance Statement**

**446 Mangaung Metropolitan Municipality
Bulk Water Pipeline Development,
Bloemfontein, Free State Province**

May 2026

Compiled for:



Compiled by:

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Aquatic Biodiversity Theme Protocol Requirements (click on links for quick access)

3. Aquatic Biodiversity Compliance Statement

3.1. The compliance statement must be prepared by a suitably qualified specialist registered with the SACNASP, with expertise in the field of aquatic sciences ([see section 12](#))

3.2. The compliance statement must:

3.2.1. be applicable to the preferred site and the proposed development footprint ([see section 4](#))

3.2.2. confirm that the site is of “low” sensitivity for aquatic biodiversity ([see section 10](#))

3.2.3. indicate whether or not the proposed development will have an impact on the aquatic features ([see section 10](#))

3.3. The compliance statement must contain, as a minimum, the following information:

3.3.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae ([see section 12](#))

3.3.2. a signed statement of independence by the specialist ([see page x](#))

3.3.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment ([see section 2](#))

3.3.4. a baseline profile description of biodiversity and ecosystems of the site ([see section 6](#)) ([see section 7](#))

3.3.5. the methodology used to verify the sensitivities of the aquatic biodiversity features on the site including the equipment and modelling used where relevant ([see section 3](#))

3.3.6. in the case of a linear activity, confirmation from the aquatic biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase ([see section 6](#)) ([see section 10](#))

3.3.7. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr ([see section 8.3](#))

3.3.8. a description of the assumptions made as well as any uncertainties or gaps in knowledge or data ([see section 5](#))

3.3.9. any conditions to which this statement is subjected ([see section 10](#))

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Abbreviations

BA	Basic Assessment
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
HGM	Hydrogeomorphic Unit
MAP	Mean Annual Precipitation
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMA	National Environmental Management Act (Act 107 of 1998)
NFA	National Forests Act (Act 84 of 1998)
NWA	National Water Act (Act 36 of 1998)
ONA	Other Natural Area
PAOI	Project Area of Influence
PES	Present Ecological State
REC	Recommended Ecological Category
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
WULA	Water Use License Application
WWTW	Wastewater Treatment Works

Declaration of Independence

I, Adriaan Johannes Hendrikus Lamprecht, declare that I:

- am the Director and Ecological Specialist of EcoFocus Consulting (Pty) Ltd
- act as an independent specialist consultant in the field of botany and ecology
- am assigned as the Ecological Specialist consultant by the Environmental Assessment Practitioner (EAP), Environmental Management Group (Pty) Ltd, for the proposed development
- do not have or will not have any financial interest in the undertaking of the proposed project activity other than remuneration for work as stipulated in the terms of reference/scope of work as per the quotation provided
- confirm that remuneration for my services relating to the proposed development is not linked to approval or rejection of the project by the competent authority
- have no interest in secondary or subsequent developments as a result of the authorisation of the proposed project
- have no and will not engage in any conflicting interests in the undertaking of the activity
- undertake to disclose to the applicant and the competent authority any information that has or may have the potential to influence the decision of the competent authority
- will provide the applicant and competent authority with access to all relevant project information in my possession whether favourable or not

AJH Lamprecht



Signature

1. Introduction

The project applicant, Mangaung Metropolitan Municipality, proposes to formally construct an underground bulk water pipeline (0.549 m to 2.661 m deep) with a diameter ranging from 250 mm to 700 mm, directly adjacent north of the city of Bloemfontein, Free State Province. The local and broader surrounding landscape is earmarked for residential expansion of the city, and the proposed pipeline will transport and supply potable water to this envisaged future expansion.

As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature and should therefore not significantly impact on any aquatic fauna/flora. It is therefore the opinion of the specialist that the proposed development footprint can be returned to the current state within two years of the completion of the construction phase, through adequate mitigation and management.

Environmental Management Group (Pty) Ltd was appointed by the applicant as the independent Environmental Assessment Practitioner (EAP), to conduct the legally required Basic Assessment (BA) process.

A site sensitivity verification must be undertaken to determine and confirm the current land use and environmental sensitivity of the proposed development footprint as identified by the DFFE National Web-Based Environmental Screening Tool. Due to the nature of potential aquatic ecological impacts posed by the proposed development to the local aquatic ecosystem and ecology, an Aquatic Ecological assessment is required. This is required in order to determine the potential presence of ecologically sensitive/conservationally significant aquatic habitats, plant- and/or faunal species, which may be adversely affected by the proposed development.

Potential aquatic ecological receptor impacts posed by the proposed development to the local aquatic ecosystem and ecology (specific impact receptors), must be identified and evaluated. Impact receptor mitigation and management measures in accordance with the requirements of the National Environmental Management Act (Act 107 of 1998) Mitigation Hierarchy, must subsequently be recommended. This must be done in order to attempt to reduce/alleviate the adverse effects of identified potential aquatic ecological receptor impacts associated with the proposed development.

EcoFocus Consulting (Pty) Ltd was consequently appointed by the EAP as the independent aquatic ecological specialist, to conduct the required Aquatic Ecological assessment for the proposed development and to confirm/refute the environmental sensitivity of the proposed development footprint according to the relevant Biodiversity Theme Protocols. This report constitutes the Aquatic Biodiversity Theme Site Sensitivity Verification and Compliance Statement.

The scope of work is however completed in accordance with the following requirements and exemptions of Appendix D2 of the No. 4167 General Authorisations in Terms of Section 39 of the National Water Act 36 of 1998 for Water Uses as Defined in Section 21(c) or Section 21(i), Gazette No. 49833:

- Water provision institutions are exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix for all maintenance of existing water pipelines and construction of new raw and drinking water pipelines 1.5 meter diameter and smaller crossing non-perennial rivers and/or wetlands outside delineated wetland boundary or extent.

2. Date and Season of Aquatic Biodiversity Site Assessment

Date: 13 & 15 May 2026

Duration: 9 hours

Season: These dates form part of the winter season. The seasonal timing of the assessment also did not coincide with the general flowering times of potential floral Species of Conservation Concern (SCC) and was therefore not favourable for successful identification of such species, if present. It must therefore be noted that the seasonal timing of the assessment was not favourable for successful identification of all aquatic plant species (hydrophytes) individuals. More hydrophytes could therefore potentially be present throughout the identified aquatic habitats, which were not necessarily visible aboveground due to the timing of the site assessment.

The seasonal timing of the assessment was not optimal for successful identification of potential aquatic faunal Species of Conservation Concern (SCC), if present. The assessment did not coincide with the high-activity- and breeding periods of the listed aquatic faunal Species of Conservation Concern (SCC).

3. Methodology

The methodology is implemented for the Project Area of Influence (PAOI) as per the minimum requirements of the relevant Aquatic Biodiversity Theme Protocol. The scope of work is however completed in accordance with the following requirements and exemptions of Appendix D2 of the No. 4167 General Authorisations in Terms of Section 39 of the National Water Act 36 of 1998 for Water Uses as Defined in Section 21(c) or Section 21(i), Gazette No. 49833:

- Water provision institutions are exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix for all maintenance of existing water pipelines and construction of new raw and drinking water pipelines 1.5 meter diameter and smaller crossing non-perennial rivers and/or wetlands outside delineated wetland boundary or extent.

Preliminary preparations conducted prior to the Aquatic Ecological site assessment, were as follows:

- Georeferenced spatial information was obtained of the proposed development footprint, in order to determine the potential direct and indirect impact footprint area (study area/PAOI).
- A desktop study was conducted of the most up-to-date information/data available on the relevant vegetation types, national/provincial biodiversity conservation status/significance and the potential/likely presence of watercourses/wetlands associated with the study area/PAOI.
- A desktop assessment was conducted of conservationally significant aquatic faunal and floral species which can potentially be encountered within the study area/PAOI.

Aquatic Biodiversity Theme

- Significant watercourses and/or wetlands and/or other aquatic ecological features/habitats were identified, delineated and discussed as per the accepted methodology described below, if potentially found to be present within the study area/PAOI or surrounding aquatic regulated areas (100 m for watercourses and 500 m for wetlands).
 - For the purposes of this investigation a wetland was defined according to the definition in the National Water Act (Act 36 of 1998) as: “land which is transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface, or the land is periodically covered with shallow water and which in normal circumstances, supports or would support vegetation typically adapted to life in saturated soil.”
 - In 2005 Department of Water Affairs and Forestry (DWAF) published a wetland delineation procedure in a guideline document titled “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas”. These guidelines contain a number of stipulations relating to the protection of wetlands and the undertaking of wetland assessments.
 - To delineate any wetland, the following criteria is used in accordance with the Department of Water Affairs (DWA): Updated manual for identification and delineation of wetlands and riparian areas, Edition 2 September 2008.
 - The wetland delineation procedure identifies the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas. This constitutes the part of the wetland that might remain flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.
 - The guidelines also state that the locating of the outer edge of the temporary zone must make use of four specific indicators namely:
 - terrain unit indicator
 - soil form indicator
 - soil wetness indicator
 - vegetation indicator
 - In addition, the watercourse/wetland and a protective buffer zone beginning from the outer edge of any potential wetland temporary zone, will be designated as sensitive in a sensitivity map, if found to be necessary and applicable to a specific site. The guidelines stipulate buffers to be delineated around the boundary of a wetland. An adequate protective buffer zone, beginning from the outer edge of any potential wetland temporary zone, will be implemented and designated as sensitive within which no development must be allowed to occur, if found to be necessary and applicable to a specific site.

- Visual observations/identifications were made of general aquatic botanical/vegetation habitats and their conditions as well as any aquatic ecologically sensitive/conservationally significant areas/habitats within the study area/PAOI.
- Visual observations/identifications were made of general and conservationally significant aquatic plant species encountered within the study area/PAOI.
 - Identified plant species were listed and categorised as per the Red Data Species List; Nationally Protected Tree Species List of the National Forests Act (Act 84 of 1998), Threatened or Protected Species (ToPS) List of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA ToPS, 2023), Provincially Protected species of the Free State's Nature Conservation Ordinance (No 8 of 1969) as well as the Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014.
- Georeferenced photographs were taken of any Red Data Species Listed-, nationally- or provincially protected aquatic plant species, ecologically sensitive/conservationally significant aquatic areas as well as significant watercourses and/or wetlands and/or other aquatic ecological features/habitats, if encountered within the study area/PAOI. This was done in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

The **Present Ecological State (PES)** of all significant aquatic features/habitats identified within the study area/PAOI, was determined and discussed as per the table below, by conducting a WET-Health Level 1b assessment for wetlands or the Index of Habitat Integrity assessment (IHI, 1999) for watercourses.

- The Present Ecological State (PES) refers to the current state or condition of an area in terms of all its characteristics and reflects the change to the area from its reference condition. The value gives an indication of the alterations that have occurred in the ecosystem.

Table 1: Criteria for PES calculations

PES Category	Score	Description
A	0 – 0.9 > 90 - 100%	Unmodified , natural and pristine.
B	1 – 1.9 > 80 - 90%	Largely natural . A small change in natural habitats and biota may have taken place but the ecosystem functionality has remained essentially unchanged.
C	2 – 3.9 > 60 - 80%	Moderately modified . Moderate loss and transformation of natural habitat and biota have occurred, but the basic ecosystem functionality has still remained predominantly unchanged.
D	4 – 5.9 > 40 - 60%	Largely modified . A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred.
E	6 – 7.9 > 20 - 40%	Seriously modified . The loss of natural habitat, biota and basic ecosystem functionality is extensive.
F	8 – 10 0 - 20%	Critically/Extremely modified . Transformation has reached a critical level and the ecosystem has been modified completely with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is irreversible.

The **Ecological Importance and Sensitivity (EIS)** of all significant aquatic features/habitats identified within the study area/PAOI, was determined and discussed as per the table below, by conducting a WET-EcoServices assessment for wetlands or rapid EIS for watercourses.

- The Ecological Importance and Sensitivity (EIS) of an area is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. Both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance, once it has occurred.

Table 2: Criteria for EIS calculations

EIS Category	Score	Description
D	≤ 1.0	Low/Marginal. Not ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.
C	1.1 - 2	Moderate. Ecologically important and sensitive on local or possibly provincial scale. Biodiversity is still relatively ubiquitous and not usually sensitive to habitat modifications.
B	2.1 - 3	High. Ecologically important and sensitive on provincial or possibly national scale. Biodiversity is relatively unique and may be sensitive to habitat modifications.
A	3.1 - 4	Very High. Ecologically important and sensitive on national and possibly international scale. Biodiversity is very unique and sensitive to habitat modifications.

The **Recommended Ecological Category (REC)** of all significant aquatic features/habitats identified within the study area/PAOI, was determined and discussed as per the table below.

- The Recommended Ecological Category (REC) of an area is an expression of the ecological category, within which it is recommended for a water resource to be managed. In the event of a high EIS value, the management objective should constitute improvement of the water resource condition. In the event of a medium or low EIS value, the management objective should constitute maintenance of the current water resource condition. The PES value however also bears relevance in determining a feasible REC value.

Table 3: Criteria for REC calculations

PES Category	EIS Category			
	Very High	High	Moderate	Low
A	A - Maintain	A - Maintain	A - Maintain	A - Maintain
B	A - Improve	A/B - Improve	B - Maintain	B - Maintain
C	B - Improve	B/C - Improve	C - Maintain	C - Maintain
D	C - Improve	C/A - Improve	D - Maintain	D - Maintain
E	D - Improve	D - Improve	D - Improve	D - Improve
F	D - Improve	D - Improve	D - Improve	D - Improve

Potential aquatic ecological receptor impacts posed by the proposed development to the local aquatic ecosystem and ecology (specific impact receptors), were identified and evaluated. Impact mitigation and management measures in accordance with the requirements of the National Environmental Management Act (Act 107 of 1998) Mitigation Hierarchy, are subsequently recommended, in order to attempt to reduce/alleviate the adverse effects of identified potential aquatic ecological receptor impacts.

Plant Species Theme

- Each identified non-exempted aquatic ecological feature within the study area/PAOI was assessed on foot in a transect/Timed-meander Search (TMS) formation.
- Aquatic vegetation sample sites were assessed in accordance with the Species Environmental Assessment Guideline (SANBI, 2020).
 - Twenty-two sample sites were assessed within the study area/PAOI.
 - This equates to an observation density of approximately 1.67 sample sites/km
 - Approximately 10-15 minutes were spent within each sample site.
 - See specialist GPS track and sample sites mapping under section 4.5.
- Visual observations/identifications were made of general aquatic botanical/vegetation habitats and their conditions as well as any ecologically sensitive/conservationally significant areas/habitats within the study area/PAOI.
- Visual observations/identifications were made of general and conservationally significant aquatic plant species encountered within the study area/PAOI.
 - Identified plant species were listed and categorised as per the Red Data Species List; Nationally Protected Tree Species List of the National Forests Act (Act 84 of 1998), Threatened or Protected Species (ToPS) List of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA ToPS, 2023), Provincially Protected species of the Free State's Nature Conservation Ordinance (No 8 of 1969) as well as the Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014.

Animal Species Theme

- A desktop assessment was conducted of conservationally significant aquatic faunal species which can potentially be encountered within the study area/PAOI.
 - The platform iNaturalist was used for the desktop assessment.
 - The likelihood was discussed of such faunal species utilising the identified aquatic botanical/vegetation habitats within the study area/PAOI as refuge or for breeding, foraging and/or persistence purposes.
- Each identified non-exempted aquatic ecological feature within the study area/PAOI was assessed on foot in a transect/Timed-meander Search (TMS) formation.
 - See specialist GPS track and sample sites mapping under section 4.5.
- No actual on-site trapping or specifically focused assessments of any aquatic faunal species was conducted.
- Aquatic faunal species encountered during the site visit were however noted and discussed.

- The aquatic faunal/floral species **Site Ecological Importance (SEI)** of the study area/PAOI was determined and discussed as per the tables below from the Species Environmental Assessment Guideline (SANBI, 2020).
 - The SEI of an area is considered to be a function of the Biodiversity Importance (BI) of the receptor (e.g. species of conservation concern, the vegetation/fauna community or habitat type present on the site) and its resilience to impacts, expressed as Receptor Resilience (RR).
 - $SEI = BI + RR$
 - BI in turn, is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor
 - $BI = CI + FI$

Table 4: Criteria for CI calculations

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km². Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km². IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 5: Criteria for FI calculations

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing).
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

Table 6: Criteria for BI calculations

Biodiversity Importance		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

Table 7: Criteria for RR calculations

Receptor Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Table 8: Criteria for SEI calculations

Site Ecological Importance		Biodiversity Importance				
		Very High	High	Medium	Low	Very Low
Receptor Resilience	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

Table 9: Interpretation of SEI calculation results

Site Ecological Importance	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

4. Study Area/Project Area of Influence (PAOI)

4.1. Study Area/PAOI Determination

The proposed pipeline will merely constitute a narrow linear clearance and excavation section of approximately ≤ 3 m in width. The majority of the proposed pipeline route will also run along- and within the road reserves of the R700 provincial road and the N1 National Highway. As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature and should therefore not significantly impact on any aquatic fauna/flora. It is therefore the opinion of the specialist that the proposed development footprint can be returned to the current state within two years of the completion of the construction phase, through adequate mitigation and management.

The significant direct potential aquatic ecological receptor impacts posed by the proposed development to the local aquatic ecosystem and ecology (specific impact receptors), will mostly be restricted to the narrow linear footprint. The nature of the development activities is therefore not expected to have a direct impact on potential aquatic Species of Conservation Concern (SCC) or habitats significantly beyond the boundaries of the proposed development footprint.

Indirect low-level potential aquatic ecological receptor impacts posed by the proposed development, will mainly consist of slight fugitive dust and noise generation, emissions and fallout along with potential limited erosion and associated dirty surface water runoff into the areas directly surrounding the footprint. Alteration/impeding and contamination of the sources/drivers and flow regimes of identified watercourses (volumes and peak flow) could however pose a significant long-term direct potential aquatic ecological receptor impact for the local surrounding landscape, which will increase the study area/PAOI. Contamination of soil and groundwater resources by hydrocarbons and other chemicals in the event of potential leakages/seepages, ruptures, overflows or operational spillages at the proposed development, could also pose significant long-term direct potential aquatic ecological receptor impacts for the local surrounding landscape, which will increase the study area/PAOI.

If unmitigated, the significant potential long-term aquatic ecological receptor impacts identified for the proposed development, could potentially add low to moderate impact. It is however the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all the identified potential aquatic ecological receptor impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended mitigation measures (see section 8.3). It is therefore not anticipated that the proposed development will add any significant residual aquatic ecological receptor impacts to the surrounding aquatic environment, if all recommended mitigation measures as per this aquatic ecological report (see section 8.3) are adequately implemented and managed, for both the construction- and subsequent operational phases of the proposed development.

The PAOI will therefore merely constitute a maximum 20 m area surrounding the proposed development footprint. The assessed study area however extends significantly beyond and surrounding the proposed development footprint and consequently includes and exceeds the PAOI.

4.2. Study Area/PAOI Description

The study area/PAOI constitutes a single narrow linear footprint area of approximately 13.2 km in length. The proposed development footprint will traverse the following farm properties (south-north):

- Remaining Extent of the Farm The Kloof No. 2921 (SG 21 Digit Code: F00300000000292100000)
- Portion 1 of the Farm Penrose No. 2378 (SG 21 Digit Code: F00300000000237800001)
- Remaining Extent of the Farm Cerillio No. 2766 (SG 21 Digit Code: F00300000000276600000)
- Remaining Extent of the Farm Cleveleys No. 2990 (SG 21 Digit Code: F00300000000299000000)
- Portions 8 and 10 of the Farm Bergendal No. 1706 (SG 21 Digit Codes: F00300000000170600008 & F00300000000170600010)
- Remaining Extent as well as Portions 2, 3, 4 and 7 of the Farm Annex Woldealskloof No. 2607 (SG 21 Digit Codes: F00300000000260700000, F00300000000260700002, F00300000000260700003, F00300000000260700004 & F00300000000260700007)
- Remaining Extent and Portion 3 of the Farm Mountain View No. 1707 (SG 21 Digit Codes: F00300000000170700000 & F00300000000170700003)
- Remaining Extent of the Farm Olrig No. 1710 (SG 21 Digit Code: F00300000000171000000)
- Portion 4 of the Farm Wildealskloof No. 1205 (SG 21 Digit Code: F00300000000120500004)

The study area/PAOI is located directly adjacent north of the city of Bloemfontein, Free State Province. The study area/PAOI forms part of the Mangaung Metropolitan Municipality. According to the information received from the EAP, the proposed development footprint falls inside the municipal urban edge. Access to the study area/PAOI is obtained by way of the R700 provincial road and the N1 National Highway as well as subsequent dirt roads.

See locality map below (see A3 sized map in the Appendices: Appendix 1).

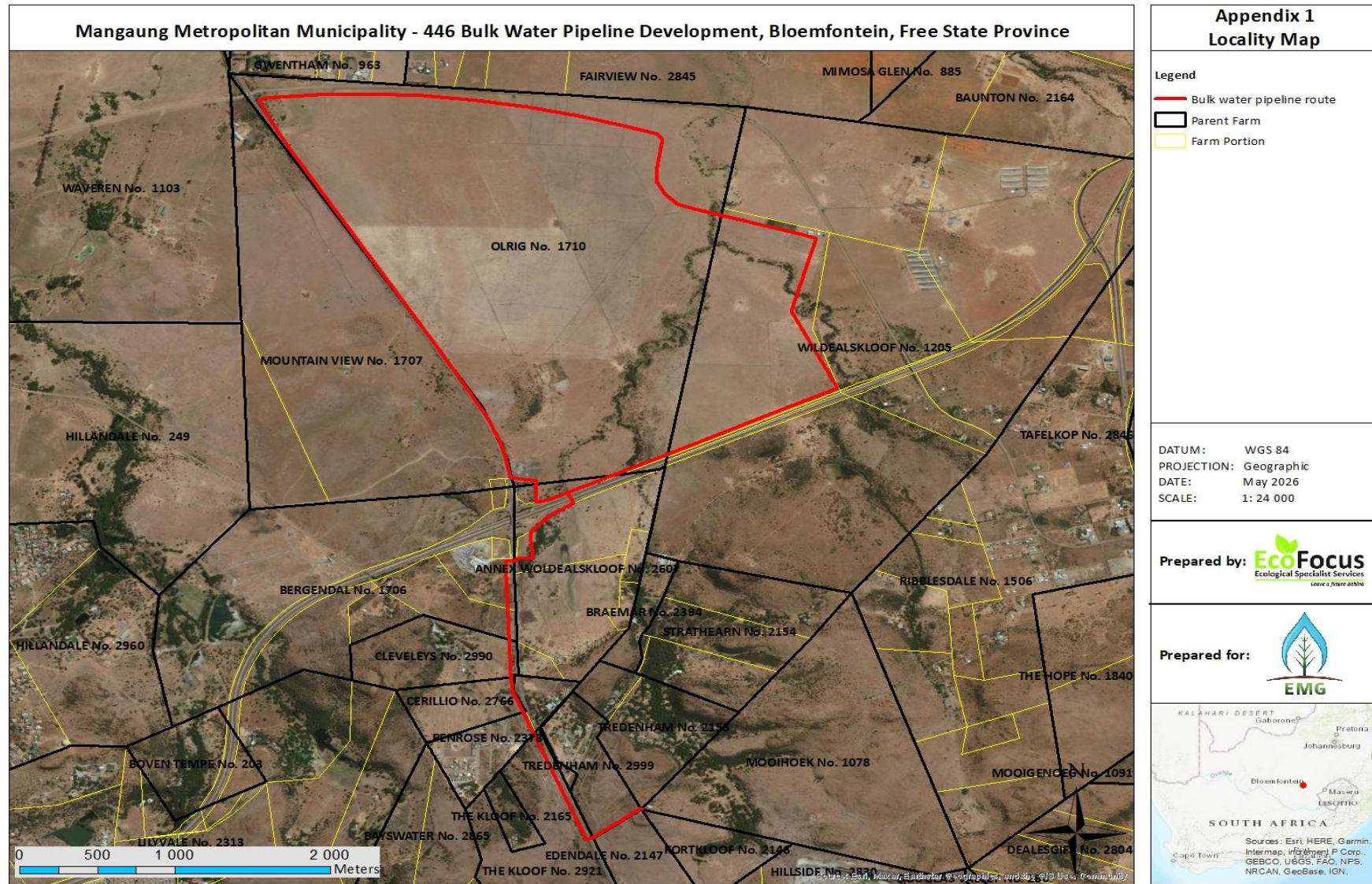


Figure 1: Locality map illustrating the proposed development footprint

4.3. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 548 mm (www.climate-data.org). The maximum average monthly temperature is approximately 22.7°C in the summer months while the minimum average monthly temperature is approximately 8.3°C during the winter (www.climate-data.org). Maximum daily temperatures can reach up to 30.3°C in the summer months and dip to as low as -0.5°C during the winter (www.climate-data.org).

4.4. Vegetation Type and Provincial Biodiversity Status

4.4.1. Vegetation Type

According to SANBI (2006-2024), the study area falls within the following vegetation types:

- Bloemfontein Karroid Shrubland vegetation type (Gh 8) (southern section)
- Winburg Grassy Shrubland vegetation type (Gh 7) (majority central section)
- Bloemfontein Dry Grassland vegetation type (Gh 5) (northern section)
- These vegetation types are all classified as Least Concerned (Monyeki & Skowno, 2025).

4.4.2. Provincial Aquatic Biodiversity Status

The Free State Province does not possess separate/specific spatial data for terrestrial and aquatic provincial biodiversity conservation statuses/categories. The relevant provincial information is rather combined into a single wholistic provincial biodiversity conservation status/category spatial data set, which sets out biodiversity priority areas in the province. This spatial data set is known as the Free State Provincial Spatial Biodiversity Plan (Collins, 2019).

The overwhelming majority of the study area is categorised as Ecological Support Area one (ESA 1), while merely the short central section is categorised as Ecological Support Area two (ESA 2), according to the Free State Provincial Spatial Biodiversity Plan (Collins, 2019).

ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area, or to generate or deliver ecosystem services, or to meet remaining biodiversity targets for ecosystem types or species when it is not possible or not necessary to meet them in natural or near-natural areas (Collins, 2024).

According to the information received from the competent authority, the specific ESA 1 & 2 categorisations within the study area are associated with the following ecological factors:

- Three vegetation types (Bloemfontein Dry Grassland (Gh 5)-, Winburg Grassy Shrubland (Gh 7)- & Bloemfontein Karroid Shrubland (Gh 8) vegetation types; see section 4.4.1)
- Threatened plants habitat (specifically the Globally/Nationally Least Concerned species *Strumaria tenella*; Free State snowflake)
- Threatened birds habitat (specifically the Globally/Nationally Least Concerned species *Falco naumanni*; Lesser kestrel)
- Freshwater Ecosystem Priority Area (FEPA) (see section 7.2)

See vegetation type-, provincial biodiversity status- and specialist GPS track maps below (see A3 sized maps in the Appendices: Appendix 2, 3 & 4).

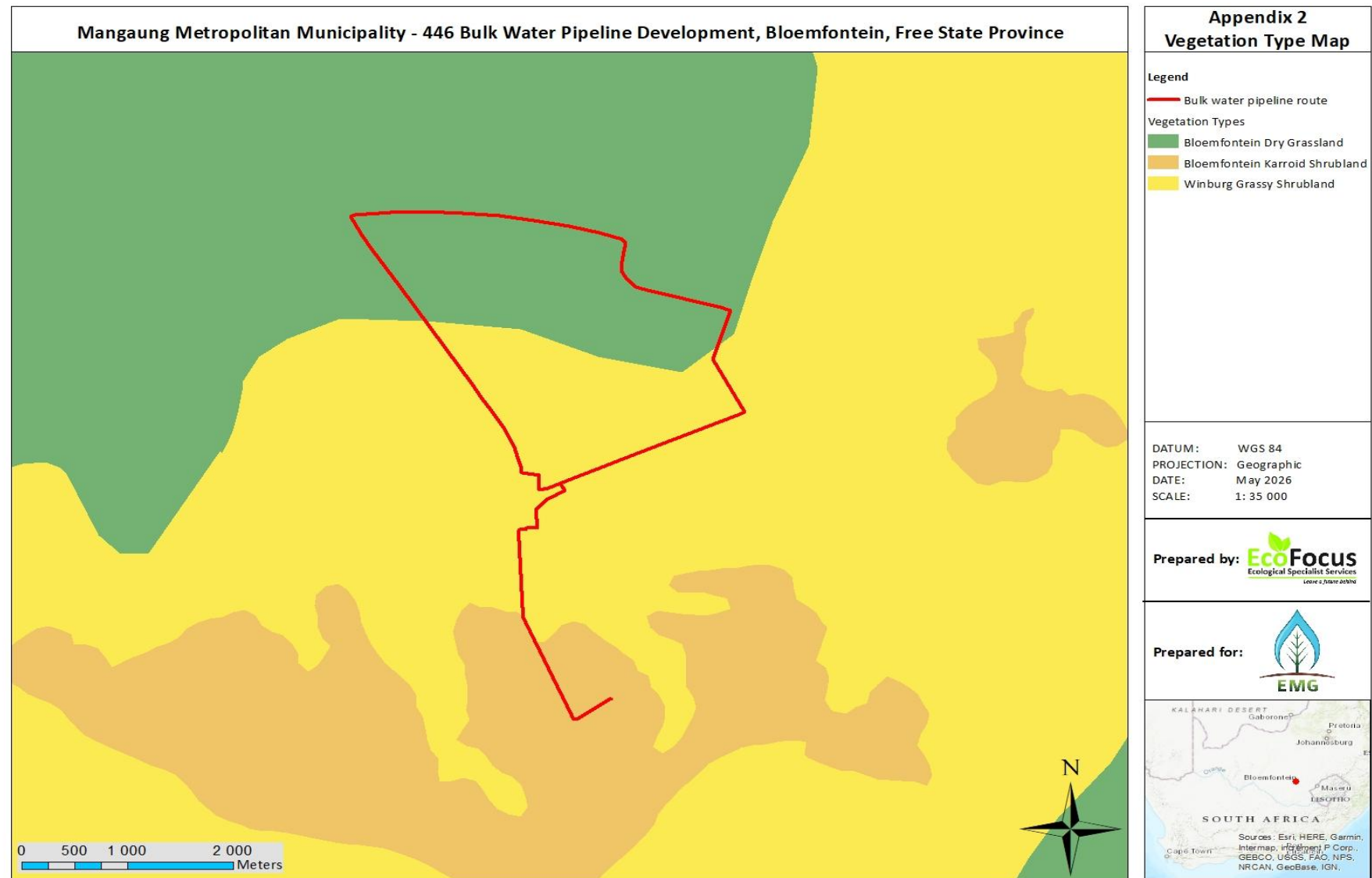


Figure 2: Vegetation type map illustrating the vegetation types associated with the study area

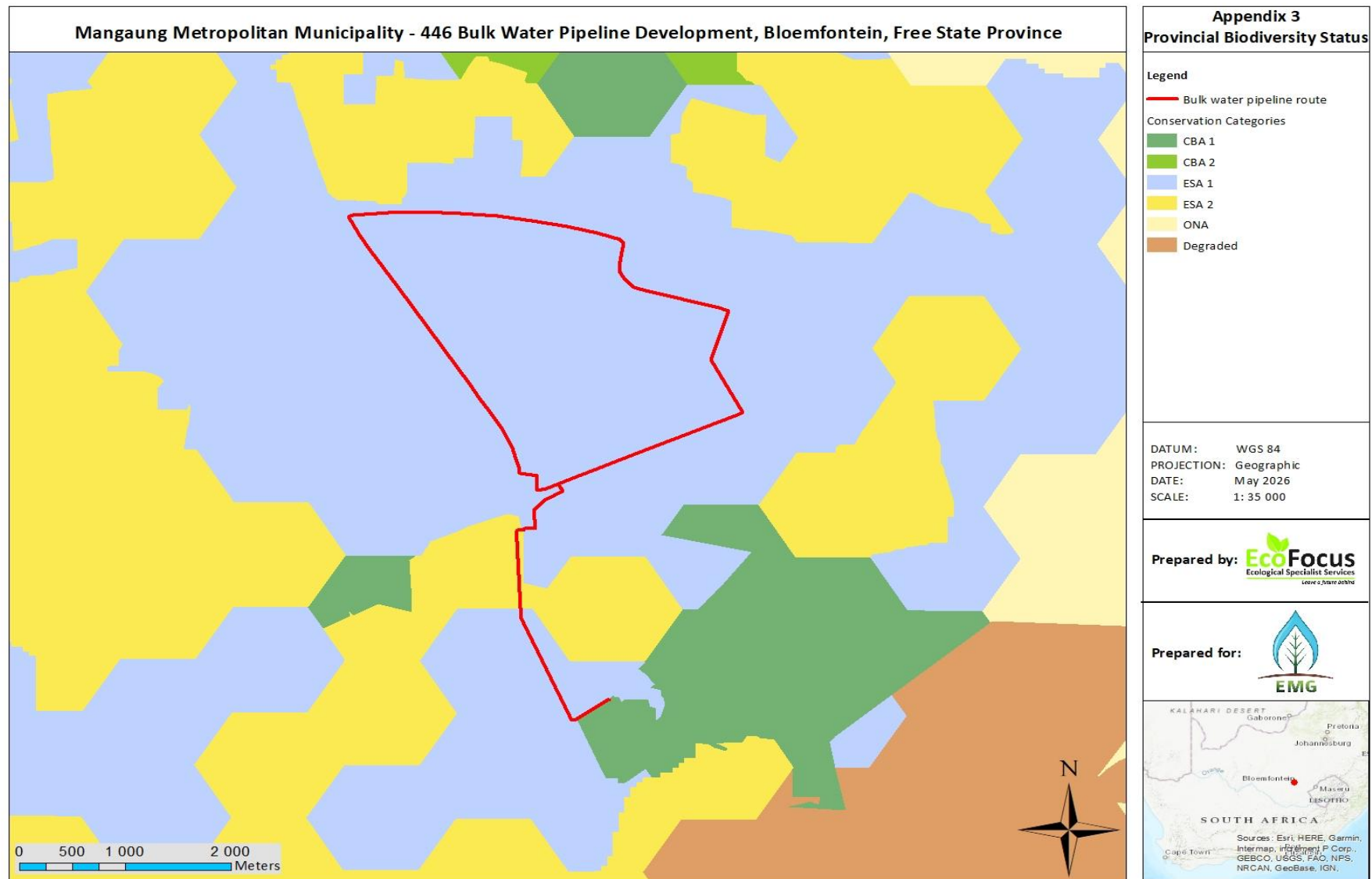


Figure 3: Provincial biodiversity status map illustrating the provincial biodiversity statuses/categories associated with the study area

4.5. Specialist GPS Track and Aquatic Vegetation Sample Sites Map

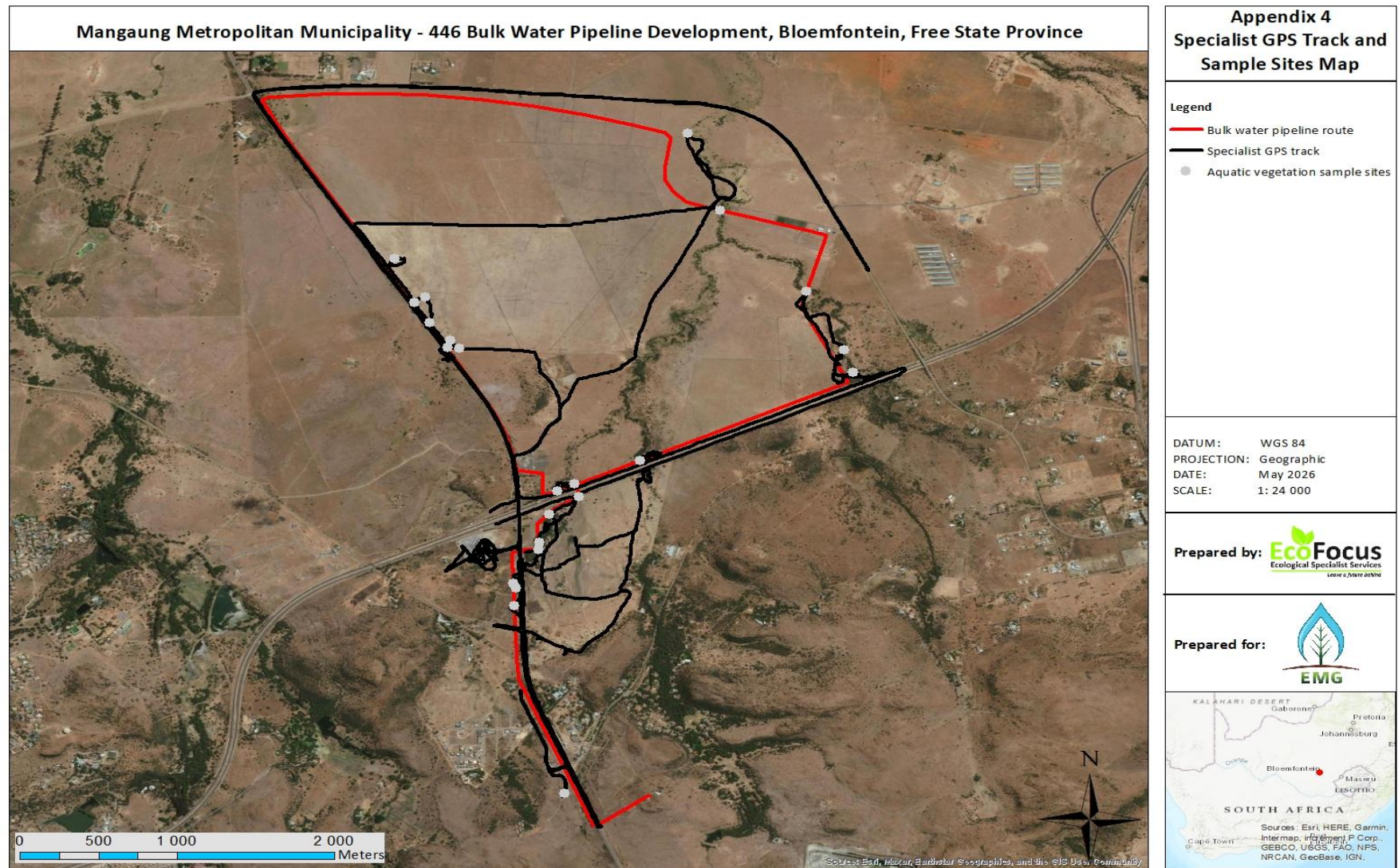


Figure 4: Specialist GPS track and aquatic vegetation sample sites map illustrating the assessment route used by the specialist

5. Assumptions, Uncertainties and Gaps in Knowledge

Various assumptions need to be made during the assessment process, at the hand of the relevant specialist. It is assumed that:

- all relevant project information provided to the ecological specialist by the EAP, was correct and valid at the time that it was provided.
- the study area as provided by the EAP, is correct and will not be significantly deviated from, as this was the only area assessed.
- strategic level investigations undertaken by the applicant prior to the commencement of the Environmental Impact Assessment/Basic Assessment process, determined that the study area represents a potentially suitable and technically acceptable location.
- the public, local communities, relevant organs of state and surrounding landowners will receive a sufficient reoccurring opportunity to participate and comment on the proposed development during the Environmental Impact Assessment/Basic Assessment process, through the provision of adequately facilitated public participation interventions and timeframes as stipulated in the NEMA: EIA Regulations, 2014.
- the need and desirability of the proposed development is based on strategic national, provincial and local plans and policies, which reflect the interests of both statutory and public viewpoints.
- it is assumed that strategic level decision making by the relevant authorities will be conducted through cooperative governance principles, with the consideration of environmentally sustainable and responsible development principles underpinning all decision making.

Given that an EIA/BA involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the EIA/BA process, namely process-related and prediction-related.

- uncertainty of prediction is critical at the data collection phase as observations, recommendations and conclusions are made, solely based on professional specialist opinion. Final certainty will only be obtained upon actual implementation of the proposed development. Adequate research, specialist experience and expertise should however minimise this uncertainty.
- the EIA/BA process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts, associated with the construction- and subsequent operational phases of the proposed development.
- uncertainty of relevant decision making relates to the interpretation of provided information by relevant authorities during the EIA/BA process. Continual two-way communication and coordination between EAP's and relevant authorities should however decrease the uncertainty of subjective interpretation. The importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant information and impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this document) can further standardise the objective interpretation of results and limit the occurrence and scale of uncertainty and subjectivity.
- the principle of human nature provides for uncertainties and unpredictability with regards to the socio-economic impacts of the proposed developments and the subsequent public reaction/opinion, which will be received during the Public Participation Process (PPP).

Gaps in knowledge as well as assessment qualifications and restrictions can be attributed to:

- This assessment does not include Terrestrial Faunal/Floral Assessments. A separate terrestrial specialist must be appointed to conduct a specific Terrestrial Ecological Assessment.
- This report purely constitutes an Aquatic Biodiversity Assessment; no terrestrial ecological aspects were therefore assessed or taken into consideration during any discussions, conclusions and/or recommendations associated with this report
- The scope of work is however completed in accordance with the following requirements and exemptions of Appendix D2 of the No. 4167 General Authorisations in Terms of Section 39 of the National Water Act 36 of 1998 for Water Uses as Defined in Section 21(c) or Section 21(i), Gazette No. 49833:
 - Water provision institutions are exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix for all maintenance of existing water pipelines and construction of new raw and drinking water pipelines 1.5 meter diameter and smaller crossing non-perennial rivers and/or wetlands outside delineated wetland boundary or extent.
- The aquatic ecological assessment process was undertaken prior to the availing of certain information, which would only be derived from the final development design and layout. The design layout for the proposed development, had not been finalised yet at the time of the site assessment.
- The assessment was restricted to the winter season. The seasonal timing of the assessment also did not coincide with the general flowering times of potential floral Species of Conservation Concern (SCC) and was therefore not favourable for successful identification of such species, if present. It must therefore be noted that the seasonal timing of the assessment was not favourable for successful identification of all aquatic plant species (hydrophytes) individuals. More hydrophytes could therefore potentially be present throughout the identified aquatic habitats, which were not necessarily visible aboveground due to the timing of the site assessment. Due to the narrow temporary linear footprints at any watercourse crossings, it is however not considered necessary to perform an additional summer/growing season survey.
- The seasonal timing of the assessment was not optimal for successful identification of potential aquatic faunal Species of Conservation Concern (SCC), if present. The assessment did not coincide with the high-activity- and breeding periods of the listed aquatic faunal Species of Conservation Concern (SCC).

- As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature and should therefore not significantly impact on any aquatic fauna/flora. It is therefore the opinion of the specialist that the proposed development footprint can be returned to the current state within two years of the completion of the construction phase, through adequate mitigation and management.
- Extensive existing residential, industrial and commercial transformation associated with the city as well as historical and currently active agricultural cropland cultivation transformation, is evident throughout the local and broader surrounding landscape, intertwined to a lesser extent, with portions of undeveloped reasonably natural habitat. This local surrounding landscape is therefore highly transformed and fragmented, from an ecological connectivity, - functionality and -integrity perspective. The narrow temporary linear size of the study area is also minute relative to the portions of undeveloped reasonably natural habitat and disturbance is merely temporary in nature.
- The local and broader surrounding landscape is earmarked for residential expansion of the city. It is therefore highly likely that further similar pipeline network development and subsequent transformation would take place throughout the local area, which would lead to further cumulative impacts.

Disclaimer: EcoFocus Consulting is an independent ecological specialist company. All information and recommendations as per this report are therefore provided in a fair and unbiased/objective manner and are solely based on qualitative data gathered as well as professional specialist observation and opinion. The study is based on assessment techniques and investigations which are limited by time and budgetary constraints typically applicable to the type and level of survey undertaken. EcoFocus Consulting therefore reserves the right to modify aspects of the project deliverables if and when new/additional information may become available, be it from research, identifications or further work in the applicable field of practice or pertaining to this study.

EcoFocus Consulting exercises all reasonable skill, care and diligence in the provision of services. EcoFocus Consulting will however accept no liability or consequential liability for the use of the provided project deliverables (in part or in whole) and any information or material contained therein. The applicant, including its agents, by receiving these deliverables indemnifies EcoFocus Consulting (including its members, employees and sub-consultants) against any actions, claims, demands, losses, liabilities, costs, damages and expenses arising directly or indirectly from or in connection with services rendered, directly or indirectly by EcoFocus Consulting.

6. Site Sensitivity Verification

6.1. Aquatic Biodiversity Theme

According to the DFFE National Web-Based Environmental Screening Tool Report, the Aquatic Biodiversity Theme of the study area is rated as being of 'very high' sensitivity due to the area falling within a Freshwater Ecosystem Priority Area (FEPA) (see section 7.2).

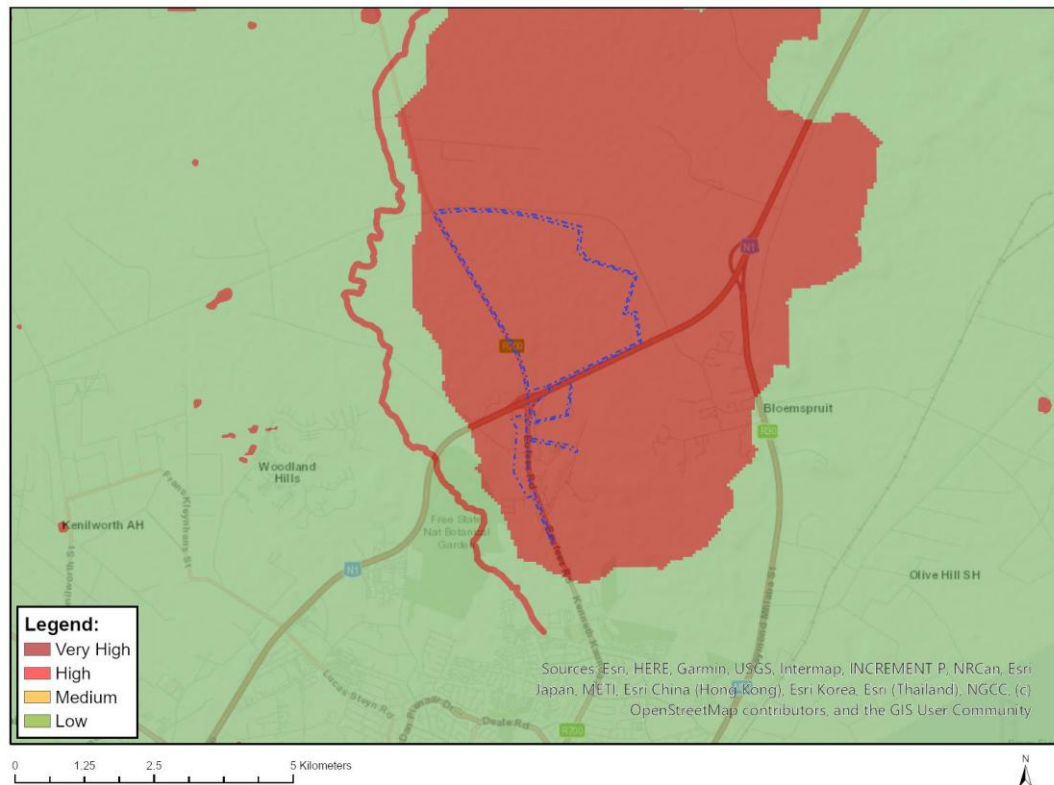


Figure 5: Aquatic Biodiversity Theme Sensitivity as per the DFFE National Web-Based Environmental Screening Tool Report

'Ground truthing' conducted during the site assessment, determined that six first-order non-perennial watercourses (small and very small ephemeral preferential water flow paths/drainage lines) are rather traversed by the proposed development footprint. Another single first-order non-perennial watercourse (very small ephemeral preferential water flow path/drainage line) also flows past the southern section of the proposed development footprint within 100 m to the west. A single third-order- and two second-order non-perennial watercourses (significant seasonal streams) are furthermore also traversed by the proposed development footprint. These watercourses are however all exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3).

A single very small depression wetland is situated within 100 m to the east of the central section of the proposed development footprint. This wetland is however exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3).

An anthropogenically established linear artificially wet area is present along the western side of the R700 provincial road associated with the southern section of the proposed development footprint. This artificially wet area is intermittently traversed by the proposed development footprint at five short sections. This artificially wet area is however exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3).

According to the National Freshwater Ecosystem Priority Areas Database (NFEPA, 2011), the portion of the C52G - 3571 Sub Quaternary Reach (SQR) associated with the study area, does not fall within any Fish Support Area, -Sanctuary, -Corridor or -Rehabilitation Area. No populations of conservationally significant threatened fish species have been recorded throughout the study area or local downstream region or are expected to specifically/exclusively rely on the study area as refuge or for breeding, foraging and/or persistence purposes.

These factors reduce the aquatic conservational significance/value of the area. The study area however falls within a Freshwater Ecosystem Priority Area (FEPA), which significantly increases the aquatic conservational significance/value of the area. The narrow temporary linear size of the proposed development footprint is however negligible relative to the Freshwater Ecosystem Priority Area (FEPA) and it is situated in the upper reaches of the FEPA and Sub Quaternary Reach, a significant distance upslope of the associated Modder River (>15.5 km). Substantial natural buffering is therefore present throughout the Freshwater Ecosystem Priority Area (FEPA) downslope of the proposed development footprint, before reaching the River.

As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature and should therefore not significantly impact on any aquatic fauna/flora. It is therefore the opinion of the specialist that the proposed development footprint can be returned to the current state within two years of the completion of the construction phase, through adequate mitigation and management.

If unmitigated, it is consequently anticipated that the proposed development could potentially merely pose a slight risk to achieving and maintaining national and/or provincial aquatic conservation- and persistence targets of the area by impacting on the continued ecological connectivity, -functionality and -integrity of the local watershed and broader sub-quaternary surface water catchment and drainage area and consequently impacting the Freshwater Ecosystem Priority Area (FEPA).

If adequate mitigation measures are however implemented for the construction- and subsequent operational phases (see section 8.3), it is not anticipated that the proposed development would pose any significant residual risk to achieving and maintaining national and/or provincial aquatic conservation- and persistence targets of the area. It will also not significantly impact on any local aquatic ecological features (watercourses or wetlands) or the continued ecological connectivity, -functionality and -integrity of the local watershed and broader sub-quaternary surface water catchment and drainage area. Mitigation measures must therefore focus on ensuring that the natural flow regimes of the Freshwater Ecosystem Priority Area (FEPA) and watercourses are as far as practicably possible/feasible, not significantly and/or permanently contaminated or impacted by the proposed development.

Based on the outcomes and results of the site assessment, the specialist is therefore not in agreement with the DFFE National Web-Based Environmental Screening Tool Report's classification of a 'very high' Aquatic Biodiversity Theme sensitivity rating for the study area. It is the opinion of the specialist that the majority of the study area is rather rated as being of 'low' sensitivity. It is also the opinion of the specialist that the identified significant third-order- and easterly situated second-order seasonal streams to be crossed, are rather rated as being of 'medium' sensitivity. As mentioned, it is the opinion of the specialist that the proposed development footprint can be returned to the current state within two years of the completion of the construction phase, through adequate mitigation and management. In accordance with section 1.4 of the Aquatic Biodiversity Theme Protocol, merely a Compliance Statement is therefore required for the Aquatic Biodiversity Theme in order to inform the Basic Assessment (BA) process associated with the proposed development

See aquatic site sensitivity verification map below (see A3 sized map in the Appendices: Appendix 5).

6.2. Aquatic Site Sensitivity Verification Map

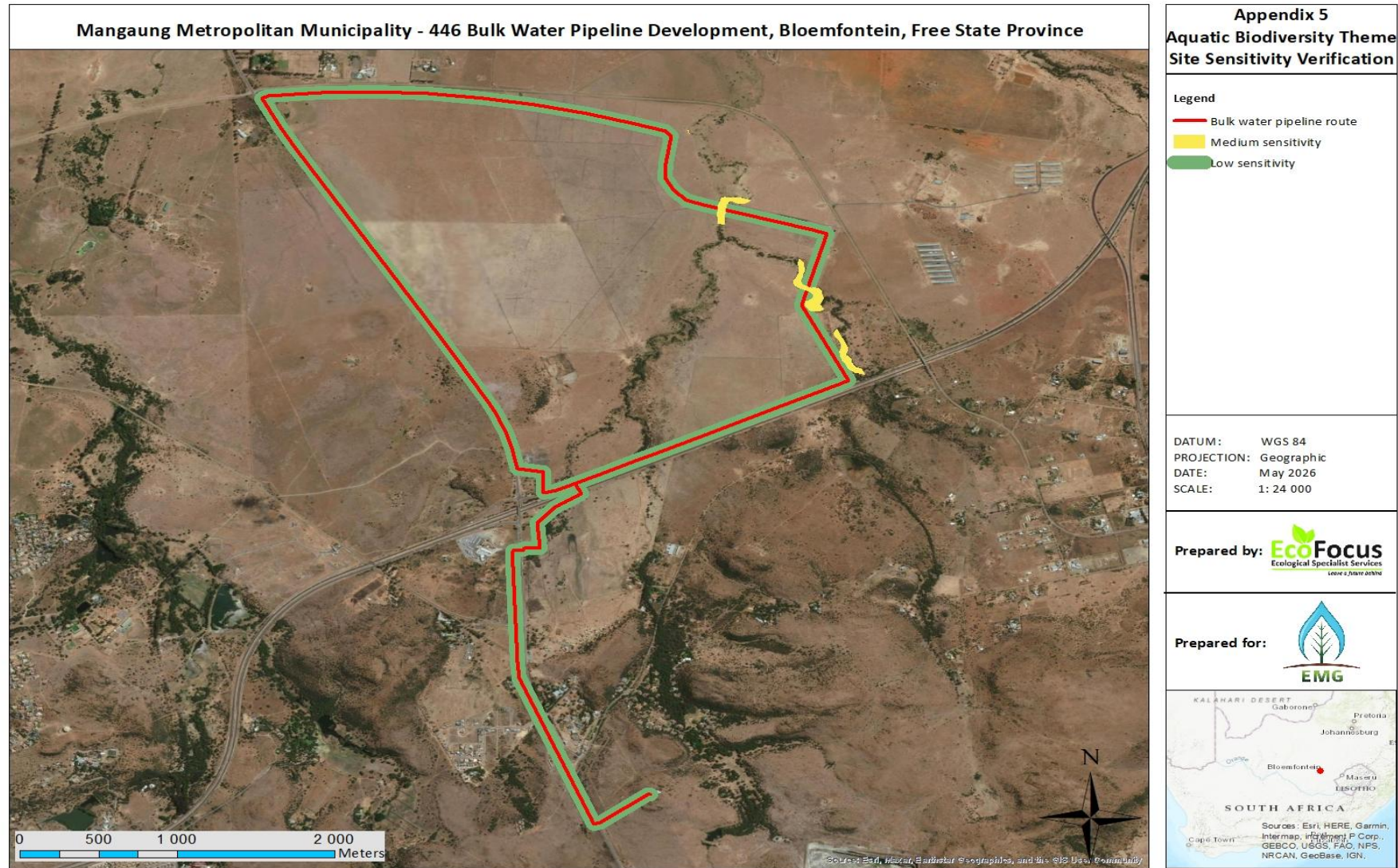


Figure 6: Aquatic site sensitivity verification map illustrating the sensitivities of the Aquatic Biodiversity Theme associated with the study area

7. Compliance Statement

7.1. Water Catchment and Drainage

The study area falls within the Upper Orange Water Management Area (WMA 13) and the associated C52G quaternary surface water catchment and drainage area. It is furthermore situated in the C52G - 3571 Sub Quaternary Reach (SQR), within the Highveld Ecoregion (11). The study area generally slopes slightly towards the north.

7.2. Watercourse Baseline Information

According to the available desktop water catchment and drainage data of the latest South African National Biodiversity Assessment of 2018 (Van Deventer *et al.*, 2019) and National Wetland Map 6 (SANBI, 2024), there are no significant natural perennial watercourses, -wetlands or -salt pans which will be directly crossed by the proposed development footprint, as per the Appendix D2 exemptions (see section 3). Five non-perennial watercourses are traversed by the proposed development footprint (Van Deventer *et al.*, 2019 & SANBI, 2024).

‘Ground truthing’ conducted during the site assessment, however determined that six first-order non-perennial watercourses (small and very small ephemeral preferential water flow paths/drainage lines) are rather traversed by the proposed development footprint. Another single first-order non-perennial watercourse (very small ephemeral preferential water flow path/drainage line) also flows past the southern section of the proposed development footprint within 100 m to the west. A single third-order- and two second-order non-perennial watercourses (significant seasonal streams) are furthermore also traversed by the proposed development footprint. These watercourses are however all exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3).

A single very small depression wetland is situated within 100 m to the east of the central section of the proposed development footprint. This wetland is however exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3).

An anthropogenically established linear artificially wet area is present along the western side of the R700 provincial road associated with the southern section of the proposed development footprint. This artificially wet area is intermittently traversed by the proposed development footprint at five short sections. This artificially wet area is however exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3).

According to the National Freshwater Ecosystem Priority Areas Database (NFEPA, 2011), the portion of the C52G - 3571 Sub Quaternary Reach (SQR) associated with the study area, does not fall within any Fish Support Area, -Sanctuary, -Corridor or -Rehabilitation Area. No populations of conservationally significant threatened fish species have been recorded throughout the study area or local downstream region or are expected to specifically/exclusively rely on the study area as refuge or for breeding, foraging and/or persistence purposes.

These factors reduce the aquatic conservational significance/value of the area. The study area however falls within a Freshwater Ecosystem Priority Area (FEPA), which significantly increases the aquatic conservational significance/value of the area. The narrow temporary linear size of the proposed development footprint is however negligible relative to the Freshwater Ecosystem Priority Area (FEPA) and it is situated in the upper reaches of the FEPA and Sub Quaternary Reach, a significant distance upslope of the associated Modder River (>15.5 km). Substantial natural buffering is therefore present throughout the Freshwater Ecosystem Priority Area (FEPA) downslope of the proposed development footprint, before reaching the River.

As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature and should therefore not significantly impact on any aquatic fauna/flora. It is therefore the opinion of the specialist that the proposed development footprint can be returned to the current state within two years of the completion of the construction phase, through adequate mitigation and management.

If unmitigated, it is consequently anticipated that the proposed development could potentially merely pose a slight risk to achieving and maintaining national and/or provincial aquatic conservation- and persistence targets of the area by impacting on the continued ecological connectivity, -functionality and -integrity of the local watershed and broader sub-quaternary surface water catchment and drainage area and consequently impacting the Freshwater Ecosystem Priority Area (FEPA).

If adequate mitigation measures are however implemented for the construction- and subsequent operational phases (see section 8.3), it is not anticipated that the proposed development would pose any significant residual risk to achieving and maintaining national and/or provincial aquatic conservation- and persistence targets of the area. It will also not significantly impact on any local aquatic ecological features (watercourses or wetlands) or the continued ecological connectivity, - functionality and -integrity of the local watershed and broader sub-quaternary surface water catchment and drainage area. Mitigation measures must therefore focus on ensuring that the natural flow regimes of the Freshwater Ecosystem Priority Area (FEPA) and watercourses are as far as practicably possible/feasible, not significantly and/or permanently contaminated or impacted by the proposed development.

See Van Deventer *et al.*, 2019 and SANBI, 2024 desktop water catchment and drainage data map below (see A3 sized map in the Appendices: Appendix 6).

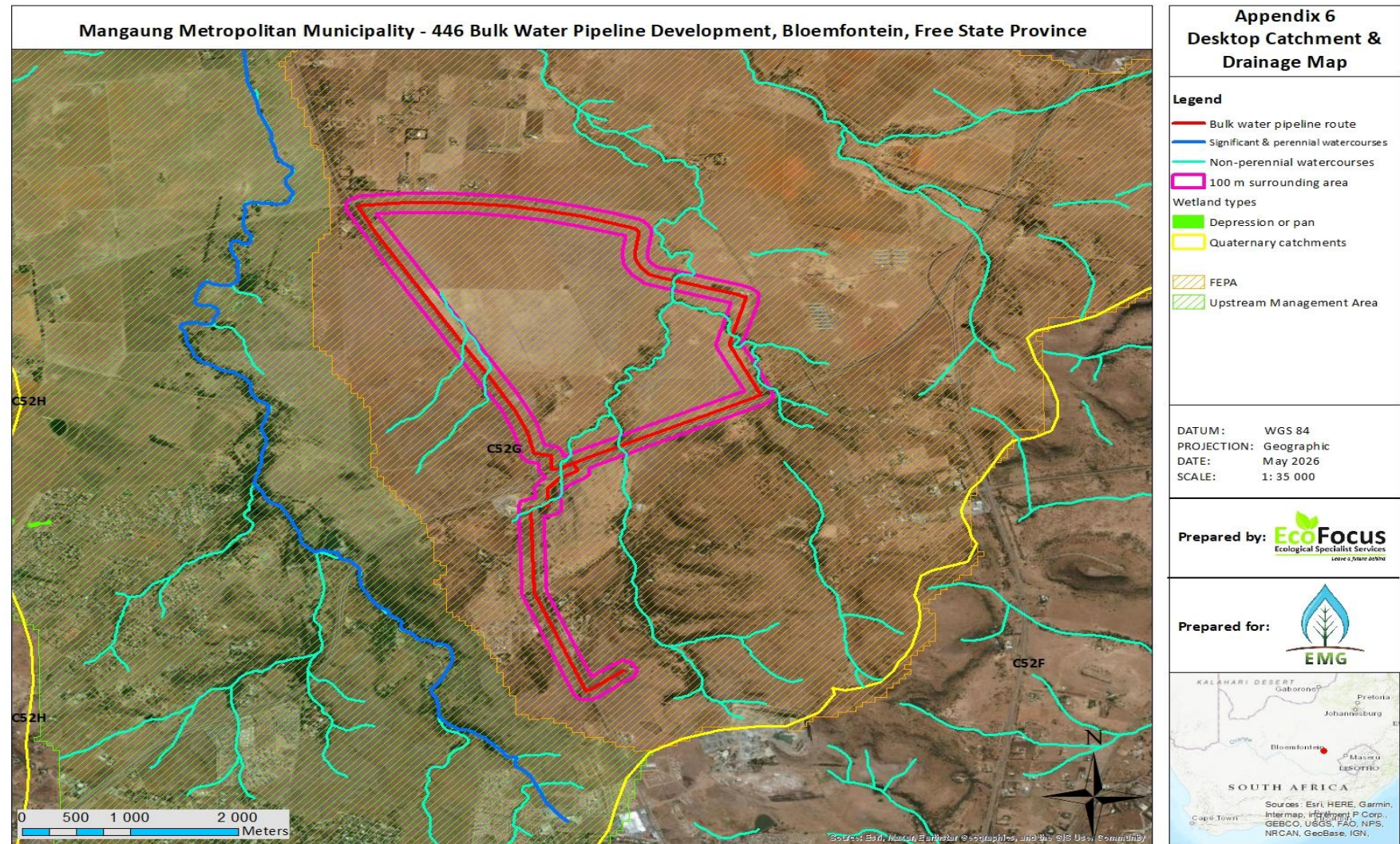


Figure 7: Van Deventer *et al.*, 2019 and SANBI, 2024 desktop water catchment and drainage data map illustrating the main watercourses and wetlands/pans as well as the Freshwater Ecosystem Priority Area (FEPA) and quaternary surface water catchment and drainage area associated with the study area

7.3. Significant Streams

A single third-order- and two second-order non-perennial watercourses (significant seasonal streams) are traversed by the proposed development footprint. The two second-order streams flow from the south through culverts underneath the N1 National Highway and are then traversed by the central and eastern sections of the proposed development footprint. These two streams respectively continue in north-easterly (centrally situated stream) and northerly (easterly situated stream) directions and eventually join each other/confluence a significant distance downstream, to form the single third-order stream. This third-order stream continues in a northerly direction and is then traversed by the north-eastern section of the proposed development footprint.

These watercourses are however all exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3).

7.3.1. Sources/Drivers

The sources/headwaters of the two second-order streams are respectively located approximately 3 km south and south-east of the study area. The streams possess small to moderately sized upstream surface water catchment areas and consequently assist with channelling low to moderate volumes of seasonal surface water runoff during seasonal rainfall events. The subsequent third-order stream resulting from the confluence of the two second-order streams, then assists with channelling the combined moderate volumes of seasonal surface water runoff during seasonal rainfall events.

7.3.2. Habitat

The third-order stream possesses a distinct broad and reasonably deep active streamflow channel with a slightly broader surrounding moderate density linear riparian woodland habitat along its edges/banks (regulated area as no 1:100-year floodline delineation is available). The sewage contamination associated with the westerly situated of the small first-order ephemeral preferential water flow path/drainage line (see section 7.4.2) and the significant second-order seasonal stream (see discussion later below) which are both traversed by the central section of proposed development footprint, flows downstream and eventually discharges into this significant third-order seasonal stream. Due to the downstream dilution effect, the presence and smell of raw sewage is however not clearly evident throughout the stream.

This historical and continued diluted indirect discharge has therefore resulted in slight to moderate undesired contamination and eutrophication of the stream as well as the stream being artificially maintained in a semi-perennial low-flow state, over time.

Due to the historical and continued discharge, the localised area surrounding this specific short section which will be traversed by the proposed development footprint, houses locally ecologically distinct and important perennial semi- and fully aquatic grass- and sedgeland habitats within the channel and along its edges/banks.

The grassland habitat mainly constitutes a reasonably representative mixture of the obligate hydrophytic grass species *Echinochloa holubii* and *Leptochloa fusca* as well as the facultative hydrophytic grass species *Cynodon dactylon*, *Eragrostis spp.*, *Leersia hexandra*, *Panicum coloratum*, *P maximum*, *Paspalum dilatatum*, *Pennisetum sphacelatum*, *Setaria incrassata*, *S sphacelata*, *Sporobolus fimbriatus*, *Themeda triandra* (Van Oudtshoorn, 2022).

The sedgeland habitat mainly constitutes a reasonably representative mixture of the obligate hydrophytic sedge and rush species *Cyperus denudatus*, *C fastigiatus*, *C laevigatus*, *C marginatus*, *Eleocharis dregeana*, *Ficinia nodosa*, *Fuirena pubescens*, *Juncus capitatus*, *J effusus*, *J lomatophyllus* and *Scirpoides dioecus*. Patches/clusters of the obligate hydrophytic sedge species *Typha capensis* are also moderately present throughout the flow channel.

The forb species *Berkheya radula*, *B rigida*, *Centella asiatica*, *Clematis brachiata*, *Erigeron bonariensis*, *Haplocarpha scaposa*, *Hermannia depressa*, *Lindernia conferta*, *Nidorella anomala*, *Oenothera rosea*, *Plantago lanceolata*, *Polygonum spp.*, *Sphaeralcea bonariensis*, *Trifolium africanum*, *Verbena aristigera* as well as the legally declared alien invasive species *Verbena bonariensis* (Category 1b) were found to be moderately present along the edges/banks of the flow channel.

The riparian woodland habitat is mainly dominated by medium sized to large tree individuals of the species *Searsia lancea* and *Vachellia karroo*, while the non-woody shrub species *Asparagus spp.* and the woody species *Buddleja saligna* are also well-represented. The woody species *Celtis africana* and the provincially protected species *Olea europaea* were also found to be present but to a lesser extent. The woody species *Ehretia rigida*, *Gymnosporia buxifolia* and *Ziziphus mucronata* were merely found to be sparsely present throughout the woodland.

The habitat associated with this localised area surrounding the specific short section of the stream to be traversed, is in a reasonably natural to merely slightly disturbed climax ecological state. The disturbance is mainly as a result of the slight to moderate undesired contamination and eutrophication caused by the historical and continued diluted sewage discharge.

Due to the semi-perennial state of the stream along with the presence of the dense riparian woodland habitat, the stream is visibly extensively utilised by various common/general aquatic bird-, amphibian- and other aquatic faunal species. This semi-perennial state has however solely formed- and is maintained artificially and is therefore not viewed as being ecologically sustainable in the long-term as the water supply sources can and should in actual fact have been repaired by the municipality, immediately or at least as soon as practicably/reasonably possible after the issue arose. Once reparations occur, it will result in the complete and permanent cessation of the semi-perennial instream state. The stream should then revert back to its original seasonally active ecological state.



Figure 8: Two images illustrating representative examples of the reasonably natural to merely slightly disturbed perennial semi- and fully aquatic grass- and sedgeland habitats associated with the localised area surrounding the specific short section of the third-order non-perennial watercourse (significant seasonal stream) which is traversed by the north-eastern section of the proposed development footprint; the presence of the moderate density linear riparian woodland habitat along its edges/banks is visibly evident (red arrows indicate the water flow direction)

The second-order stream which is traversed by the central section of proposed development footprint, possesses a distinct narrow active streamflow channel with a broad surrounding very dense linear riparian woody thicket habitat along its edges/banks (regulated area as no 1:100-year floodline delineation is available). The stream is visibly continuously fed by raw/untreated sewage discharge emanating from a significantly leaking sewage pumpstation situated directly adjacent south of the N1 National Highway and to the west of the stream. The presence and smell of raw sewage is clearly evident throughout the stream.

This historical and continued direct discharge has therefore resulted in significant undesired contamination and eutrophication of the stream as well as the stream being artificially maintained in a semi-perennial low-flow state, over time. The sewage contamination flows downstream and eventually discharges into the significant third-order seasonal stream (see discussion earlier above).

The broadness and very high density of the riparian woody thicket habitat is most probably as a result of the historical and continued discharge. Due to this very high density, the localised area surrounding this specific short section which will be traversed by the proposed development footprint, does not receive sufficient sunlight penetration for significant undergrowth vegetation establishment on the thicket floor. Despite the artificially maintained semi-perennial low-flow state of the stream, this section of the stream consequently possesses no ecologically distinct or important hydrophytic vegetation habitat within the channel or along its edges/banks. It rather merely constitutes a relatively barren unvegetated flow channel. The very sparse undergrowth inside the thicket mainly consists of opportunistic pioneer forb/weed species.

The riparian woody thicket habitat is overwhelmingly dominated by medium sized to large tree individuals of the species *Searsia lancea* and *Vachellia karroo*. The woody species *Celtis africana* and the provincially protected species *Olea europaea* were also found to be present but to a lesser extent. The woody species *Buddleja saligna* and *Ziziphus mucronata* were merely found to be sparsely present throughout the thicket.

Due to the semi-perennial state of the stream along with the presence of the very dense riparian woody thicket habitat, the stream is visibly extensively utilised by various common/general aquatic bird-, amphibian- and other aquatic faunal species. This semi-perennial state has however solely formed- and is maintained artificially and is therefore not viewed as being ecologically sustainable in the long-term as the water supply source can and should in actual fact have been repaired by the municipality, immediately or at least as soon as practicably/reasonably possible after the issue arose. Once reparations occur, it will result in the complete and permanent cessation of the semi-perennial instream state. The stream should then revert back to its original seasonally active ecological state.



Figure 9: Two images illustrating representative examples of the artificially established semi-perennial low-flow state associated with the localised area surrounding the specific short section of the second-order non-perennial watercourse (significant seasonal stream) which is traversed by the central section of the proposed development footprint; the presence of the very dense linear riparian woody thicket habitat along its edges/banks as well as the relatively barren unvegetated flow channel and lack of undergrowth vegetation along with the grey water colour associated with the raw/untreated sewage discharge, are visibly evident (red arrows indicate the water flow direction)

The second-order stream which is traversed by the eastern section of proposed development footprint, possesses a distinct narrow active streamflow channel with a broad surrounding dense linear riparian woodland habitat along its edges/banks (regulated area as no 1:100-year floodline delineation is available). The localised area surrounding this specific short section which will be traversed by the proposed development footprint, houses a locally ecologically distinct and important seasonal semi-aquatic sedgeland habitat within the channel and along its edges/banks. Due to the high density of the riparian woodland habitat, this section of the stream however merely receives limited sunlight penetration for undergrowth vegetation establishment on the woodland floor. The semi-aquatic sedgeland habitat although present, is consequently reasonably sparse.

The sparse sedgeland habitat mainly consists of the obligate hydrophytic sedge species *Cyperus spp.* The sparse undergrowth inside the woodland mainly consists of opportunistic pioneer forb/weed species.

The riparian woodland habitat is overwhelmingly dominated by medium sized to large tree individuals of the species *Searsia lancea* and *Vachellia karroo*. The woody species *Celtis africana* and the provincially protected species *Olea europaea* were also found to be present but to a lesser extent. The woody species *Buddleja saligna* and *Ziziphus mucronata* were merely found to be sparsely present throughout the woodland.

The habitat associated with this localised area surrounding the specific short section of the stream to be traversed, is in a reasonably natural climax ecological state. Due to this reasonably natural seasonal state of the stream habitat along with the presence of the dense riparian woodland habitat, the stream is visibly extensively utilised by various common/general aquatic bird-, amphibian- and other aquatic faunal species.



Figure 10: Two images illustrating representative examples of the reasonably natural seasonal semi-aquatic sedgeland habitat associated with the localised area surrounding the specific short section of the second-order non-perennial watercourse (significant seasonal stream) which is traversed by the eastern section of the proposed development footprint; the presence of the dense linear riparian woodland habitat along its edges/banks as well as the merely sparse undergrowth vegetation, are visibly evident (red arrows indicate the water flow direction)

No other hydrophytic/obligate- or facultative aquatic grass-, reed-, sedge- or rush species were found to be present throughout the localised areas surrounding the specific short sections of the significant seasonal streams associated with the proposed development footprint, during the site assessment.

The provincially protected species *Olea europaea* was found to be present to a lesser extent, throughout the riparian woodland- and woody thicket habitats associated with the significant seasonal streams.

Apart from this species, no Red Data Listed-, nationally protected tree- or other provincially protected aquatic plant species or any other aquatic floral Species of Conservation Concern (SCC), were found to be present throughout the localised areas surrounding the specific short sections of the significant seasonal streams associated with the proposed development footprint, during the site assessment.

It is therefore evident from a hydrological- and aquatic faunal/floral biodiversity perspective, that the significant third-order- and easterly situated second-order seasonal streams associated with the study area constitute moderate to moderately high importance components of the local watershed and broader sub-quaternary surface water catchment and drainage area as well as the aquatic faunal/floral ecology of the area. These streams therefore possess moderate to moderately high overall long-term aquatic ecological/conservational value/significance. The centrally located second-order seasonal stream associated with the study area however constitutes a low to moderate importance component and therefore possesses a low to moderate overall long-term aquatic ecological/conservational value/significance.

The Mitigation measures must consequently focus on ensuring that the natural flow regimes of the Freshwater Ecosystem Priority Area (FEPA) and streams are as far as practicably possible/feasible, not significantly and/or permanently contaminated or impacted by the proposed development.

7.3.3. Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) & Recommended Ecological Category (REC)

See section 3 for the methodology outlining the criteria for categorisation of Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) & Recommended Ecological Category (REC).

These watercourses all are exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3). It is therefore the opinion of the specialist that PES, EIS or REC determinations are not applicable.

7.4. Preferential Water Flow Paths/Drainage Lines

Six first-order non-perennial watercourses (small and very small ephemeral preferential water flow paths/drainage lines) are traversed by the proposed development footprint. Three of these flow paths/drainage lines flow from the west through culverts underneath the R700 provincial road and are then traversed by the north-western section of the proposed development footprint. These three flow paths/drainage lines continue in a northerly direction and virtually immediately join each other/confluence directly adjacent east of the road. This flow paths/drainage lines confluence however eventually dissipates into the surrounding terrestrial grassland landscape a short distance downstream.

A fourth flow path/drainage line is traversed by the northern section of the proposed development footprint. This flow path/drainage line flows from the south through a culvert underneath a significant dirt road and continues in a northerly direction. The flow path/drainage line however eventually dissipates into the semi-rural landscape of the Mimosa Park Smallholdings, a short distance downstream.

The other two of the six flow paths/drainage lines flow from the south through culverts underneath the N1 National Highway and are then traversed by the central section of the proposed development footprint. These two flow paths/drainage lines continue in a north-easterly direction and virtually immediately join each other/confluence directly adjacent north of the Highway.

Another single first-order non-perennial watercourse (very small ephemeral preferential water flow path/drainage line) also flows past the southern section of the proposed development footprint within 100 m to the west. This flow path/drainage line continues in a northerly direction.

These watercourses are however all exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3).

7.4.1. Sources/Drivers

The sources/headwaters of the flow paths/drainage lines are all located within 1.5 km of the study area. The flow paths/drainage lines possess small upstream surface water catchment areas and consequently merely assist with channelling low volumes of temporary surface water runoff during seasonal rainfall events.

7.4.2. Habitat

The four flow paths/drainage lines which are traversed by the north-western and northern sections of proposed development footprint, do not possess distinct active streamflow channels but rather constitute merely slight linear surface depressions within the local landscape. The localised areas surrounding these specific short sections which will be traversed by the proposed development footprint, house a locally ecologically distinct seasonal semi-aquatic grassland habitat (100 m surrounding regulated area as no 1:100-year floodline delineation or riparian habitat is available).

The grassland habitat is mainly dominated by the facultative hydrophytic grass species *Panicum maximum*, *Setaria incrassata*, *S sphacelata* and *Cynodon dactylon*, while the species *Themeda triandra* is also well-represented (Van Oudtshoorn, 2022). The facultative hydrophytic- and terrestrial grass species *Eragrostis spp.* were also found to be present but to a lesser extent (Van Oudtshoorn, 2022). The terrestrial grass species *Melinis repens* was merely found to be sparsely present throughout these localised areas surrounding the specific short sections of the flow paths/drainage lines to be traversed. Small isolated patches/clusters of the obligate hydrophytic sedge species *Cyperus spp.* are furthermore also sporadically present along the lengths of the flow paths/drainage lines.

The forb species *Berkheya rigida*, *Erigeron bonariensis*, *Nidorella anomala*, *Sphaeralcea bonariensis*, *Verbena aristigera* as well as the legally declared alien invasive species *Verbena bonariensis* (Category 1b) were found to be moderately present throughout these localised areas surrounding the specific short sections of the flow paths/drainage lines to be traversed.

Small- to medium sized shrub and tree individuals of the woody species *Vachellia karroo*, *Searsia lancea*, *Ehretia rigida* as well as the non-woody shrub species *Asparagus spp.* were found to be moderately present throughout these localised areas surrounding the specific short sections of the flow paths/drainage lines to be traversed.

The habitats associated with these localised areas surrounding the specific short sections of the flow paths/drainage lines to be traversed, are in a reasonably natural to merely slightly disturbed climax ecological state. The disturbance is mainly as a result of the slight anthropogenic surface flow alterations caused by the presences of the R700 provincial road and significant dirt road as well as surrounding farm management activities.

Due to the ephemeral state of the flow paths/drainage lines habitats along with the continued surrounding anthropogenic activities associated with the R700 provincial road and significant dirt road, the flow paths/drainage lines are not specifically/exclusively relied upon by any common/general aquatic bird-, amphibian- and other aquatic faunal species.



Figure 11: Three images illustrating representative examples of the reasonably natural to merely slightly disturbed seasonal semi-aquatic grassland habitat associated with the localised areas surrounding the specific short sections of the four first-order non-perennial watercourses (very small ephemeral preferential water flow paths/drainage lines) which are traversed by the north-western and northern sections of proposed development footprint (red arrows indicate the water flow direction)

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The westerly situated of the other two flow paths/drainage lines which is traversed by the central section of proposed development footprint, possesses a distinct narrow active streamflow channel with a broad surrounding dense linear riparian woodland habitat along its edges/banks (regulated area as no 1:100-year floodline delineation is available). The flow path/drainage line is visibly continuously fed by raw/untreated sewage discharge emanating from the west through a culvert underneath the R700 provincial road as well as a significantly leaking municipal water pipeline situated directly adjacent east of the road. The presence and smell of raw sewage is clearly evident throughout the flow path/drainage line. The leaking pipeline has furthermore also resulted in the establishment of a linear artificially wet area along the eastern boundary of the flow path/drainage line.

This historical and continued direct discharge and leakage have therefore resulted in significant undesired contamination and eutrophication of the flow path/drainage line as well as the flow path/drainage line being artificially maintained in a semi-perennial low-flow state, over time. The sewage contamination flows downstream and eventually discharges into the significant third-order seasonal stream which is traversed by the north-eastern section of the proposed development footprint (see section 7.3.2).

Due to the historical and continued discharge and leakage, the localised areas surrounding these specific short sections which will be traversed by the proposed development footprint, house artificially established perennial semi- and fully aquatic sedge- and reedland habitats within the channel and along its edges/banks. The broadness and high density of the riparian habitat is also most probably as a result of the historical and continued discharge and leakage.

Due to the semi-perennial state of the flow path/drainage line along with the presence of the dense riparian woodland habitat, the flow path/drainage line is visibly extensively utilised by various common/general aquatic bird-, amphibian- and other aquatic faunal species. These habitats have however solely formed- and are maintained artificially and are therefore not viewed as being ecologically sustainable in the long-term as the water supply sources can and should in actual fact have been repaired by the municipality, immediately or at least as soon as practicably/reasonably possible after the issues arose. Once reparations occur, it will in all probability result in the complete and permanent regression and eventual disappearance of these artificially established perennial semi- and fully aquatic instream habitats. The flow path/drainage line should then revert back to its original ephemerally active ecological state.



Figure 12: Two images illustrating representative examples of the artificially established perennial semi- and fully aquatic sedge- and reedland habitats associated with the localised areas surrounding the specific short sections of the westerly situated of the other two first-order non-perennial watercourses (small ephemeral preferential water flow path/drainage line) which is traversed by the central section of proposed development footprint; the presence of the dense linear riparian woodland habitat along its edges/banks as well as the grey water colour associated with the raw/untreated sewage discharge, are visibly evident (red arrows indicate the water flow direction)

The easterly situated of the other two flow paths/drainage lines which is traversed by the central section of proposed development footprint, possesses a shallow but distinct very narrow ephemerally active streamflow channel. This flow path/drainage line is intermittently fed by the outflow of a small anthropogenically constructed upstream earth dam.

The localised areas surrounding these specific short sections which will be traversed by the proposed development footprint, house a locally ecologically distinct reasonably natural to merely slightly disturbed seasonal semi-aquatic grassland habitat, which is similar in vegetation structure, -species composition and ecological state to that of the three north-westerly situated flow paths/drainage lines (see discussion earlier above) (100 m surrounding regulated area as no 1:100-year floodline delineation or riparian habitat is available).

Due to the ephemeral state of the flow path/drainage line habitat along with the continued surrounding anthropogenic activities associated with the N1 National Highway, the flow path/drainage line is not specifically/exclusively relied upon by any common/general aquatic bird-, amphibian- and other aquatic faunal species.



Figure 13: Image illustrating a representative example of the reasonably natural to merely slightly disturbed seasonal semi-aquatic grassland habitat associated with the localised areas surrounding the specific short sections of the easterly situated of the other two first-order non-perennial watercourses (small ephemeral preferential water flow path/drainage line) which is traversed by the central section of proposed development footprint (red arrow indicates the water flow direction)

The single first-order non-perennial watercourse (very small ephemeral preferential water flow path/drainage line) which flows past the southern section of the proposed development footprint within 100 m to the west, possesses a shallow but distinct very narrow ephemerally active streamflow channel of which the bed houses extensive exposed rocky/dolerite sheets/outcrops. The flow path/drainage line houses a locally ecologically distinct seasonal semi-aquatic grassland habitat (100 m surrounding regulated area as no 1:100-year floodline delineation or riparian habitat is available).

As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature. The proposed development will consequently not result in any significant direct or indirect impact on the flow regime of the flow path/drainage line and therefore poses no conceivable quantum of risk to the flow path/drainage line. The flow path/drainage line is therefore noted in this report, but it is consequently the opinion of the specialist that no aquatic assessment is required.



Figure 14: Image illustrating a representative example of the seasonal semi-aquatic grassland habitat associated with the single first-order non-perennial watercourse (very small ephemeral preferential water flow path/drainage line) which flows past the southern section of the proposed development footprint within 100 m to the west (red arrow indicates the water flow direction)

No other hydrophytic/obligate- or facultative aquatic grass-, reed-, sedge- or rush species were found to be present throughout the localised areas surrounding the specific short sections of the ephemeral preferential water flow paths/drainage lines associated with the proposed development footprint, during the site assessment.

No Red Data Listed-, nationally protected tree- or provincially protected aquatic plant species or any other aquatic floral Species of Conservation Concern (SCC), were found to be present throughout the localised areas surrounding the specific short sections of the ephemeral preferential water flow paths/drainage lines associated with the proposed development footprint, during the site assessment.

It is therefore evident from a hydrological- and aquatic faunal/floral biodiversity perspective, that the small and very small first-order ephemeral preferential water flow paths/drainage lines associated with the study area merely constitute low importance components of the local watershed and broader sub-quaternary surface water catchment and drainage area as well as the aquatic faunal/floral ecology of the area. The flow paths/drainage lines therefore possess low overall long-term aquatic ecological/conservational value/significance.

Mitigation measures must however still focus on ensuring that the natural flow regimes of the Freshwater Ecosystem Priority Area (FEPA) and flow paths/drainage lines are as far as practicably possible/feasible, not significantly and/or permanently contaminated or impacted by the proposed development.

7.4.3. Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) & Recommended Ecological Category (REC)

See section 3 for the methodology outlining the criteria for categorisation of Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) & Recommended Ecological Category (REC).

These watercourses all are exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3). It is therefore the opinion of the specialist that PES, EIS or REC determinations are not applicable.

7.5. Depression Wetland

A single very small depression wetland is situated within 100 m to the east of the central section of the proposed development footprint. The wetland houses a locally ecologically distinct seasonal semi-aquatic grassland habitat (500 m surrounding regulated area).

As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature. The proposed development will consequently not result in any significant direct or indirect impact on the flow regime towards the wetland and therefore poses no conceivable quantum of risk to the wetland. The wetland is therefore noted in this report, but it is consequently the opinion of the specialist that no aquatic assessment is required.

This wetland is exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3). It is therefore the opinion of the specialist that PES, EIS or REC determinations are also not applicable.



Figure 15: Image illustrating a representative example of the seasonal semi-aquatic grassland habitat associated with the depression wetland which is situated within 100 m to the east of the central section of the proposed development footprint

7.6. Artificially Wet Area

An anthropogenically established linear artificially wet area is present along the western side of the R700 provincial road associated with the southern section of the proposed development footprint. This artificially wet area is intermittently traversed by the proposed development footprint at five short sections.

The elevated state of the road along with the surrounding altered surface topography caused by associated historical construction excavation and earthmoving activities, have resulted in significant anthropogenic impeding and channelling of general surface water flow on the western upslope side of the road, during seasonal rainfall events. Under historical natural conditions, such general flow would have simply dissipated into the surrounding terrestrial grassland landscape. These significant anthropogenic alterations however cause extensive seasonal inundation and saturation and has subsequently resulted in the establishment of the artificially wet area.

The artificially wet area is also visibly continuously fed by raw/untreated sewage discharge emanating from the west. The presence and smell of raw sewage is clearly evident throughout the area. Stormwater discharge from the Shell Ultra City filling station and truckstop to the west furthermore also feeds into the artificially wet area.

This historical and continued direct discharge have therefore resulted in significant undesired contamination and eutrophication of the artificially wet area as well as the area being artificially maintained in a semi-perennial low-flow state, over time. The sewage contamination flows downstream through a culvert underneath the R700 provincial road and discharges into the westerly situated of the small first-order ephemeral preferential water flow path/drainage line which is traversed by the central section of proposed development footprint (see section 7.4.2).

Due to the historical and continued discharge, the localised areas surrounding these specific short sections which will be traversed by the proposed development footprint, house locally ecologically distinct perennial semi-aquatic reed- and sedgeland habitats.

The reedland habitat is overwhelmingly dominated by dense patches/clusters of the obligate hydrophytic reed- and sedge species *Phragmites australis* and *Typha capensis*.

The sedgeland habitat mainly constitutes a reasonably representative mixture of the obligate hydrophytic sedge and rush species *Cyperus denudatus*, *C fastigiatus*, *C laevigatus*, *C marginatus*, *Eleocharis dregeana*, *Ficinia nodosa*, *Fuirena pubescens*, *Juncus capitatus*, *J effusus*, *J lomatophyllus* and *Scirpoides dioecus*.

The obligate hydrophytic grass species *Echinochloa holubii* and *Leptochloa fusca* as well as the facultative hydrophytic grass species *Cynodon dactylon*, *Eragrostis spp.*, *Leersia hexandra*, *Panicum coloratum*, *P maximum*, *Paspalum dilatatum*, *Pennisetum sphacelatum*, *Setaria incrassata*, *S sphacelata*, *Sporobolus fimbriatus*, *Themeda triandra* are also well-represented throughout the artificially wet area (Van Oudtshoorn, 2022).

Although the artificially wet area is in a semi-perennial state, the area is merely utilised to a limited extent by common/general aquatic bird-, amphibian- and other aquatic faunal species. This is mainly due to the continued surrounding anthropogenic activities associated with the R700 provincial road. This semi-perennial state has however solely formed- and is maintained artificially and is therefore not viewed as being ecologically sustainable in the long-term as the water supply source can and should in actual fact have been repaired by the municipality, immediately or at least as soon as practicably/reasonably possible after the issue arose. Once reparations occur, it will result in the complete and permanent cessation of the semi-perennial state. The artificially wet area should then revert back to a seasonally active ecological state.

This artificially wet area is exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3). It is therefore the opinion of the specialist that PES, EIS or REC determinations are also not applicable.



Figure 16: Two images illustrating representative examples of the perennial semi-aquatic reed- and sedgeland habitats associated with the localised areas surrounding the specific short sections of the linear artificially wet area which are traversed by the southern section of the proposed development footprint along the western side of the R700 provincial road; the grey water colour associated with the raw/untreated sewage discharge, is visibly evident (red arrows indicate the water flow direction)

7.7. Animal Species Theme

The first threatened aquatic faunal species is indicated by the DFFE National Web-Based Environmental Screening Tool Report as having a 'medium' sensitivity chance/possibility of potentially/likely occurring throughout the local and broader landscape into which the study area falls. The second threatened aquatic faunal species is indicated by the platform iNaturalist as having been previously identified in the local area and therefore having a realistic chance/possibility of potentially/likely occurring throughout the local and broader landscape into which the study area falls.

Table 10: List of aquatic faunal Species of Conservation Concern (SCC) for the study area as per the DFFE National Web-Based Environmental Screening Tool Report (species are listed based on decreasing threatened status)

Taxonomic Family	Scientific Name	Common Name	Red List Categories	Habitat Requirements	Probability of Occurrence
Mustelidae	<i>Hydricis maculicollis</i>	Spotted-necked otter	Globally Threatened/Nationally Vulnerable	Perennial habitat/watercourses. aquatic	Low: No individuals, spoor, scat/droppings or any other evidence associated with the presence of this species was observed throughout the study area, during the site assessment. Due to the lack of suitable perennial aquatic habitat/watercourses throughout- or in immediate proximity to the study area required by this species, the realistic chance/possibility of this species potentially occurring throughout the study area is highly unlikely/improbable. It is anticipated that this species would rather prefer to utilise the less disturbed perennial aquatic habitat provided by the Modder River further to the north.

Taxonomic Family	Scientific Name	Common Name	Red List Categories	Habitat Requirements	Probability of Occurrence
Pyxicephalidae	<i>Pyxicephalus adspersus</i>	Giant African Bullfrog	Provincially Important	Mesic/wetland areas. This species is fossorial for most of the year, remaining buried in cocoons. Individuals emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans and ditches.	Low-Medium: No individuals, burrows or any other evidence associated with the presence of this species was observed throughout the study area, during the site assessment. An extensive search yielded no sightings/findings. The seasonal timing of the assessment was however not favourable for successful identification of this species, if present. The assessment did not coincide with the high-activity- and breeding period of this species. Although no individuals of this species were observed during the site assessment, the very small depression wetland and linear artificially wet area associated with the study area provide a degree of reasonably suitable semi-aquatic habitat for its potential occurrence. As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature. The proposed development will consequently not result in any significant direct or indirect impact on the flow regime towards the very small depression wetland and therefore poses no conceivable quantum of risk to the wetland. The narrow temporary linear size of the proposed development footprint is

					also minute relative to the artificially wet area and should therefore not significantly impact on this species, if present.
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No individuals, nests, burrows, spoor, scat/droppings or any other evidence associated with the presence of any aquatic faunal Species of Conservation Significance (SCC) was observed throughout the study area, during the site assessment. An extensive search also yielded no sightings/findings.

Although no aquatic SCC were observed during the site assessment, the significant third- and second-order seasonal streams associated with the study area, provide suitable semi- and fully aquatic habitats that can be utilised by such species as refuge or for breeding, foraging and/or persistence purposes.

Due to the semi-perennial states of the significant third-order- and centrally situated second-order seasonal streams, the westerly situated of the small first-order ephemeral preferential water flow path/drainage line which is traversed by the central section of proposed development footprint as well as the artificially wet area along with the presence of the dense riparian woodland- and woody thicket habitats, the streams and flow path/drainage line are visibly extensively utilised by various common/general aquatic bird-, amphibian- and other aquatic faunal species. Due to the continued surrounding anthropogenic activities associated with the R700 provincial road, the artificially wet area is however merely utilised to a limited extent by common/general aquatic bird-, amphibian- and other aquatic faunal species.

These semi-perennial states have however solely formed- and are maintained artificially and are therefore not viewed as being ecologically sustainable in the long-term as the water supply sources can and should in actual fact have been repaired by the municipality, immediately or at least as soon as practicably/reasonably possible after the issue arose. Once reparations occur, it will result in the complete and permanent cessation of the semi-perennial instream states. The streams, flow path/drainage line and artificially wet area should then return to their original seasonally- and ephemerally active ecological states.

Due to the reasonably natural seasonal state of the easterly situated second-order stream habitat along with the presence of the dense riparian woodland habitat, the stream is visibly extensively utilised by various common/general aquatic bird-, amphibian- and other aquatic faunal species.

Due to the ephemeral state of the other small and very small first-order ephemeral preferential water flow paths/drainage lines habitats associated with the study area along with the continued surrounding anthropogenic activities associated with the R700 provincial road and significant dirt road, the flow paths/drainage lines are not specifically/exclusively relied upon by any common/general aquatic bird-, amphibian- and other aquatic faunal species.

These factors significantly increase the aquatic faunal species conservational significance/value of the significant third- and second-order seasonal streams while the significances/values of the flow paths/drainage lines and artificially wet area are merely low.

It is therefore evident from an aquatic faunal biodiversity perspective, that the significant third-order- and easterly situated second-order seasonal streams constitute moderate to moderately high importance components of the aquatic faunal ecology of the area. The centrally situated second-order seasonal stream however constitutes a low to moderate importance component of the aquatic faunal ecology of the area. The small and very small first-order ephemeral preferential water flow paths/drainage lines as well as the artificially wet area merely constitute low importance components of the aquatic faunal ecology of the area.

As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature. It is therefore the opinion of the specialist that the proposed development footprint can be returned to the current state within two years of the completion of the construction phase, through adequate mitigation and management. Individuals/populations of any aquatic faunal Species of Conservation Significance (SCC) should therefore not be significantly and/or permanently impacted, if in fact present. It is consequently not anticipated that the proposed development would pose any significant risk to- or impact on the aquatic faunal communities throughout the local or broader surrounding landscape.

7.8. Site Ecological Importance (SEI)

See section 3 for the methodology outlining the criteria for categorisation of Site Ecological Importance (SEI) as per the Species Environmental Assessment Guideline (SANBI, 2020).

7.8.1. Plant Species

The aquatic floral species Site Ecological Importance (SEI) of the significant third-order- and easterly situated second-order seasonal streams is classified as **Medium** as they are viewed as being ecologically important and/or sensitive on local and broader scale. The streams are therefore viewed as being of moderate overall long-term conservational significance/value for habitat preservation and continued ecological connectivity, -functionality and -integrity persistence in support of the surrounding ecosystem, broader vegetation type and aquatic floral habitats. Minimisation and restoration mitigation - development activities of medium impact acceptable followed by appropriate restoration activities.

The SEI calculation is as follows:

Conservation Importance	+	Functional Integrity	=	Biodiversity Importance
(Low)	+	(High)	=	(Medium)
Biodiversity Importance	+	Receptor Resilience	=	Site Ecological Importance
(Medium)	+	(High)	=	(Medium)

The aquatic floral species Site Ecological Importance (SEI) of the significant centrally situated second-order seasonal stream, small and very small first-order ephemeral preferential water flow paths/drainage lines as well as the artificially wet area is classified as **Low** as they are merely viewed as being ecologically important and/or sensitive on local scale. The stream, flow paths/drainage lines and artificially wet area are therefore merely viewed as being of low overall long-term conservational significance/value for habitat preservation and continued ecological connectivity, -functionality and -integrity persistence in support of the surrounding ecosystem, broader vegetation type and aquatic floral habitats. Minimisation and restoration mitigation - development activities of medium to high impact are consequently acceptable followed by appropriate restoration activities.

The SEI calculation is as follows:

Conservation Importance	+	Functional Integrity	=	Biodiversity Importance
(Very Low)	+	(Medium)	=	(Very Low)
Biodiversity Importance	+	Receptor Resilience	=	Site Ecological Importance
(Very Low)	+	(High)	=	(Low)

7.8.2. Animal Species

The aquatic faunal species Site Ecological Importance (SEI) of the significant third-order- and easterly situated second-order seasonal streams is classified as **Medium** as they are viewed as being ecologically important and/or sensitive on local and broader scale. The streams are therefore viewed as being of moderate to moderately high overall long-term conservational significance/value for habitat preservation and continued ecological connectivity, -functionality and -integrity persistence in support of the surrounding ecosystem and aquatic faunal habitats. Minimisation and restoration mitigation - development activities of medium impact acceptable followed by appropriate restoration activities.

The SEI calculation is as follows:

Conservation Importance	+	Functional Integrity	=	Biodiversity Importance
(Medium)	+	(High)	=	(Medium)
Biodiversity Importance	+	Receptor Resilience	=	Site Ecological Importance
(Medium)	+	(High)	=	(Medium)

The aquatic faunal species Site Ecological Importance (SEI) of the significant centrally situated second-order seasonal stream, small and very small first-order ephemeral preferential water flow paths/drainage lines as well as the artificially wet area is classified as **Low** as they are merely viewed as being ecologically important and/or sensitive on local scale. The stream is therefore viewed as being of low to moderate overall long-term conservational significance/value for habitat preservation and continued ecological connectivity, -functionality and -integrity persistence in support of the surrounding ecosystem and aquatic faunal habitats. The flow paths/drainage lines and artificially wet area are however merely viewed as being of low overall long-term conservational significance/value. Minimisation and restoration mitigation - development activities of medium to high impact are consequently acceptable followed by appropriate restoration activities.

The SEI calculation is as follows:

Conservation Importance	+	Functional Integrity	=	Biodiversity Importance
(Low)	+	(Medium)	=	(Low)
Biodiversity Importance	+	Receptor Resilience	=	Site Ecological Importance
(Low)	+	(Medium)	=	(Low)

7.9. Aquatic Biodiversity Theme Site Sensitivity Features Map

The Aquatic Biodiversity Theme site sensitivity features map below (see A3 sized map in the Appendices) illustrates the locations of the identified aquatic ecological features associated with the study area.

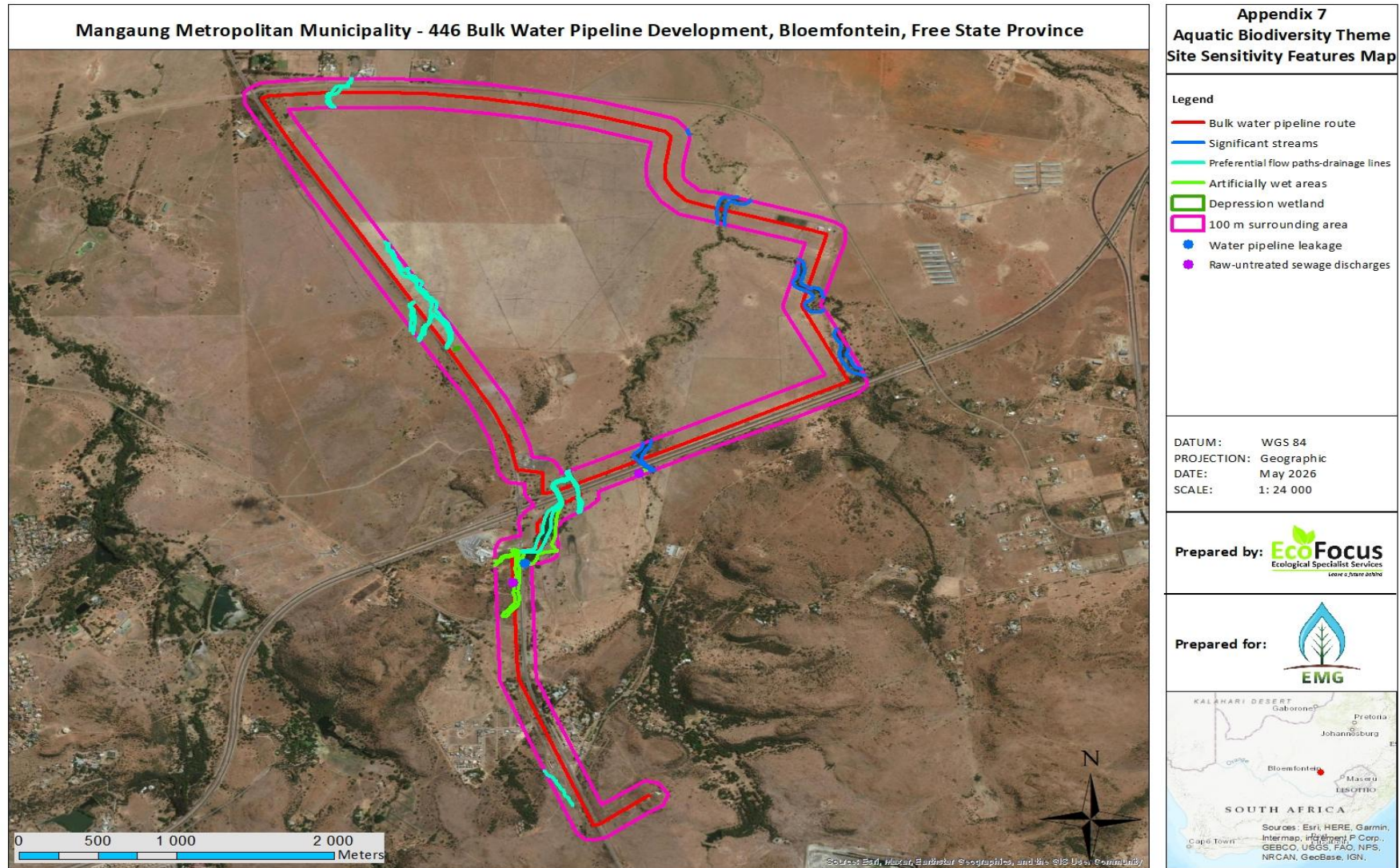


Figure 17: Aquatic Biodiversity Theme site sensitivity features map illustrating the locations of the identified aquatic ecological features associated with the study area

8. Aquatic Ecological Receptor Impact Management and Mitigation

8.1. Aquatic Receptor Impacts

As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature. It is therefore the opinion of the specialist that the proposed development footprint can be returned to the current state within two years of the completion of the construction phase, through adequate mitigation and management.

No medium- or high significance potential long-term aquatic ecological receptor impacts were identified for the proposed development. The following main aquatic ecological impact receptors could potentially be affected by the proposed development:

- Clearance and transformation of minute reasonably natural to merely slightly disturbed portions of common/general aquatic faunal/floral species habitats/individuals associated with the identified watercourses
- Exotic- and legally declared alien invasive species establishment and spreading throughout the local and broader surrounding aquatic landscape
- Noise and lighting generation and disturbance to common/general diurnal and nocturnal aquatic faunal species utilising the local surrounding landscape
- Alteration/impeding of the sources/drivers and flow regimes of the identified watercourses (volumes and peak flow) and consequent impact on the ecological functionality and -integrity of the local watershed and broader quaternary surface water catchment and drainage area
- Contamination of the sources/drivers and flow regimes of the identified watercourses and consequent impact on the ecological functionality and -integrity of the local watershed and broader quaternary surface water catchment and drainage area (hydrocarbons, other chemicals, surface material/soil erosion as well as slight fugitive dust generation, emissions and fallout)
- Contamination of soil and groundwater resources (hydrocarbons and other chemicals)

8.2. Cumulative Aquatic Impact

The local and broader surrounding landscape is earmarked for residential expansion of the city. It is therefore highly likely that further similar pipeline network development and subsequent transformation would take place throughout the local area, which would lead to further cumulative impacts.

If unmitigated, the significant potential long-term aquatic ecological receptor impacts identified for the proposed development (see section 8.1), could potentially merely add low cumulative impact to the existing negative impacts associated with the extensive existing residential, industrial and commercial transformation associated with the city as well as historical and currently active agricultural cropland cultivation transformation throughout the local and broader surrounding landscape. This local surrounding landscape is furthermore also highly transformed and fragmented, from an ecological connectivity, -functionality and -integrity perspective. The narrow temporary linear size of the study area is also minute relative to the portions of undeveloped reasonably natural habitat and disturbance is merely temporary in nature.

It is the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all the identified potential cumulative aquatic ecological receptor impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended mitigation measures (see section 8.3). It is therefore not anticipated that the proposed development will add any significant residual cumulative aquatic ecological receptor impacts to the surrounding environment, if all recommended mitigation measures as per this aquatic ecological report (see section 8.3) are adequately implemented and managed, for both the construction- and subsequent operational phases of the proposed development.

8.3. Mitigation and Management Measures

The following main aquatic ecological receptor impact management and mitigation measures are recommended for the proposed development:

- Vegetation clearance must be restricted to the narrow linear route of the proposed pipeline, as far as practicably possible/feasible
- The linear development footprint of the proposed pipeline at the proposed watercourse crossings must be kept as narrow as practicably possible/feasible to reduce the surface impact on the watercourses and no unnecessary/unauthorised footprint expansion into the surrounding undeveloped landscape may take place
- It was initially recommended by the specialist that the proposed pipeline rather be rerouted through the existing narrow open informal road crossing section situated directly adjacent north of the proposed significant third-order seasonal stream crossing, if practicably possible/feasible. This option was however confirmed by the EAP not to be feasible as the section falls within the proclaimed road reserve for the envisaged future upgrade of the road
- It was also initially recommended by the specialist that the initial southern section of the proposed pipeline rather be placed along the eastern side of the road, as far as practicably possible/feasible, due to the presence of the linear artificially wet area along the western side of the road. This option was however confirmed by the EAP not to be feasible as the section along the eastern side of the road reserve consists predominantly of rocky substrate, which would require extensive blasting activities. According to the EAP, the eastern side of the road reserve also provides very limited workspace, and in certain sections, existing services and cables are already present
 - It is consequently recommended that this section of the proposed pipeline be placed as far as practicably possible/feasible to the west along the western boundary line between the road reserve and adjacent Farm Bergendal No. 1706 to the west. This must be done in order to minimise the number and lengths of sections which traverse the artificially wet area
- Trench excavation, pipeline placement and subsequent trench backfilling at the proposed watercourse crossings must be conducted concurrently, in order to ensure continued flow through the area during the construction period. Under no circumstances may the flow of the watercourses be significantly impeded/blocked for any period of time, during construction
- Materials excavated from the proposed pipeline trench at the proposed watercourse crossings must be adequately placed/stockpiled outside the watercourse extents on the upstream side of the trench, before being backfilled into the trench after pipeline placement. This must be done in order to prevent any significant surface material/soil contamination of the watercourses

- Trench excavation, pipeline placement and subsequent trench backfilling at the proposed watercourse crossings must be conducted manually underneath the riparian woodland- and woody thicket canopies and no trees may be removed, as far as practicably possible/feasible. This must be done in order to prevent any significant damage destruction of the riparian woodland- and woody thicket habitats
- It is recommended that the pipeline be buried at a minimum depth of 1.5 m at the proposed watercourse crossings in order to allow for continued surface- and subsurface interflow of the watercourses over the pipeline
- It is recommended that adequate hydraulic designs such as siphons or culverts be incorporated underneath the pipeline at the proposed watercourse crossings if required, in order to allow for continued surface- and interflow of the watercourses underneath the pipeline
- It is important that sufficient culvert designs be installed underneath the proposed service road at the proposed watercourse crossings, if required. The design specifications and size parameters of the culverts must ensure adequate continued flow through the watercourses. These culvert designs must be able to adequately accommodate and redirect/channel the maximum volumes of water which the watercourses can receive during seasonal rainfall events
- It is recommended that the construction of the proposed watercourse crossings be conducted during the winter season as far as practicably possible/feasible. The flow of the watercourses will be significantly reduced during this time, which should ease the excavation activities and result in reduced impeding of- and impact on flow
- Any lower flow during the winter season must however still be adequately diverted/channelled around the construction area of the proposed watercourse crossings, in order to ensure continued flow through the area during the construction period. Under no circumstances may the flow of the watercourses be significantly impeded/blocked for any period of time, during construction
- If winter construction is however not practicably possible/feasible, the construction of the proposed watercourse crossings must be completed within a maximum 10-day period of which the weather forecast predicts no possibility of rainfall

- All the applicable requirements in terms of Sections 9 and 10 of GNR 40229: General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as Defined in Section 21(c) or Section 21(i), must be adequately implemented for both the construction- and subsequent operational phases of the proposed development
- It is the opinion of the specialist, that all the identified watercourses are exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3)
- A Water Use License Application (WULA)/General Authorisation (GA) registration must be submitted to the Department of Water and Sanitation for the proposed watercourse crossings and development within 500 m of the identified very small depression wetland, as required in accordance with the National Water Act (Act 36 of 1998)
- Water saving initiatives must be implemented for the proposed future residential expansion
- Environmentally responsible water-use practices and activities must be adopted for the construction- and subsequent operational phases of the proposed development
- Provide training interventions for the relevant employees on correct environmentally responsible water use practices and activities
- Existing roads and farm tracks in close proximity to the proposed development construction footprint, must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented through any aquatic features within the surrounding undeveloped landscape outside the proposed development footprint
- Disturbed areas within and immediately surrounding the proposed development construction footprints associated with the proposed watercourse crossings must be adequately rehabilitated concurrently with- or as soon as practicably possible after the construction processes. Adequate rehabilitation measures for these crossings must be included into the general Rehabilitation Management Plan for the proposed development. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced SACNASP registered ecologist
- Immediate steps must be taken by the Mangaung Metropolitan Municipality to identify and alleviate the sources of the continued unlawful raw/untreated sewage discharges which feed into the identified watercourses

- Implement adequate alien invasive species management and prevention measures during the construction- and subsequent operational phases of the proposed development. An Alien Invasive Species Management Plan must be compiled by a suitably qualified and experienced SACNASP registered ecologist, if deemed necessary by the competent authority
- It is recommended that all individuals of any identified legally declared alien invasive species must be actively eradicated from the study area and specifically surrounding the artificial flow channel, in accordance with the requirements of the National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014. Removed materials must also be adequately and lawfully disposed of, in order to prevent potential further spreading/dispersal
- Implement adequate stormwater and erosion management measures during the construction- and subsequent operational phases of the proposed development. This must be done to sufficiently manage stormwater runoff and clean/dirty water separation, in order to prevent any significant surface water contamination of the local and broader surrounding landscape as well as prevent any significant soil erosion from occurring within and around the proposed development footprint and to attempt to maintain the ecological connectivity, - functionality and -integrity of the local watershed and broader sub-quaternary surface water catchment and drainage area
- If building materials, hydrocarbons or other chemicals are to be stored on site during the construction phase, the storage areas must be situated as far away as practicably possible/feasible from any watercourses (minimum 40 m distance)
- Building material, hydrocarbon and other chemical storage areas must be adequately banded in order to be able to contain a minimum of 150 % of the capacity of storage tanks/units
- Adequate hydrocarbon and other chemical storage, handling, usage and spillage clean-up procedures must be developed, and all relevant employees must be sufficiently trained on- and apply these procedures during the construction- or subsequent operational phases
- Spill kits must be readily available at the construction- and subsequent operational site. All relevant employees must be adequately trained on the correct procedure and use of the spill kits

- Implement suitable dust suppression and management measures during the construction- and subsequent operational phases of the proposed development
- Construction areas and -roads to be sufficiently wetted down during the construction phase of the proposed development, if/when necessary, in order to suppress/prevent significant fugitive dust generation, emissions and fallout
- Adequate operational procedures for machinery and equipment must be developed to strictly govern and restrict movement of machinery, in order to avoid unnecessary fugitive dust generation, emissions and fallout and ensure environmentally responsible operational practices and activities
- It is recommended that no bright light from any spotlights or perimeter lights or loud/excessive noise should be emitted into the surrounding landscape, during the nighttime. As little light emissions as practicably/reasonably possible from the construction phase, should occur during nighttime as this could lure aquatic bird- and other nocturnal avifaunal species individuals towards the permitter fences and potentially result in collisions and mortality
- Adequate leakage detection and prevention systems/measures must be implemented for the proposed pipeline in order to detect any potential leakages
- If any leakages of the proposed pipeline occur, the necessary steps must be followed by the applicant to locate and remediate the source of leakages, as soon as practicably possible/feasible
- The integrity of the pipeline must be inspected on a regular basis and adequately maintained over time, in order to ensure its continued functionality and prevent any leakages or failures

9. Water Use License Application (WULA) Risk Assessment Matrix Summary

It is the opinion of the specialist, that all the identified watercourses are exempted from requiring an aquatic assessment and WULA Risk Assessment Matrix, as per Appendix D2 (see section 3).

10. Conclusion

It is evident from a hydrological- and aquatic faunal/floral biodiversity perspective, that the significant third-order- and easterly situated second-order seasonal streams associated with the study area constitute moderate to moderately high importance components of the local watershed and broader sub-quaternary surface water catchment and drainage area as well as the aquatic faunal/floral ecology of the area. These streams therefore possess moderate to moderately high overall long-term aquatic ecological/conservational value/significance. The centrally located second-order seasonal stream associated with the study area however constitutes a low to moderate importance component and therefore possesses a low to moderate overall long-term aquatic ecological/conservational value/significance.

It is evident from a hydrological- and aquatic faunal/floral biodiversity perspective, that the small and very small first-order ephemeral preferential water flow paths/drainage lines associated with the study area merely constitute low importance components of the local watershed and broader sub-quaternary surface water catchment and drainage area as well as the aquatic faunal/floral ecology of the area. The flow paths/drainage lines therefore possess low overall long-term aquatic ecological/conservational value/significance.

As the proposed pipeline will be placed underground, the narrow linear surface disturbance and impact associated with the proposed development is merely temporary in nature and should therefore not significantly impact on any aquatic fauna/flora. It is therefore the opinion of the specialist that the proposed development footprint can be returned to the current state within two years of the completion of the construction phase, through adequate mitigation and management.

It is consequently not anticipated that the proposed development would pose any significant residual risk to achieving and maintaining national and/or provincial aquatic conservation- and persistence targets of the area. It will also not significantly impact on any local aquatic ecological features (watercourses or wetlands) or the continued ecological connectivity, -functionality and -integrity of the local watershed and broader sub-quaternary surface water catchment and drainage area. Mitigation measures must therefore focus on ensuring that the natural flow regimes of the Freshwater Ecosystem Priority Area (FEPA) and watercourses are as far as practicably possible/feasible, not significantly and/or permanently contaminated or impacted by the proposed development.

It is furthermore also not anticipated that the proposed development would pose any significant risk to- or impact on the aquatic faunal communities throughout the local or broader surrounding landscape.

No medium- or high significance potential long-term aquatic ecological receptor impacts were identified for the proposed development. The following main aquatic ecological impact receptors could potentially be affected by the proposed development:

- Clearance and transformation of minute reasonably natural to merely slightly disturbed portions of common/general aquatic faunal/floral species habitats/individuals associated with the identified watercourses
- Exotic- and legally declared alien invasive species establishment and spreading throughout the local and broader surrounding aquatic landscape
- Noise and lighting generation and disturbance to common/general diurnal and nocturnal aquatic faunal species utilising the local surrounding landscape
- Alteration/impeding of the sources/drivers and flow regimes of the identified watercourses (volumes and peak flow) and consequent impact on the ecological functionality and -integrity of the local watershed and broader quaternary surface water catchment and drainage area
- Contamination of the sources/drivers and flow regimes of the identified watercourses and consequent impact on the ecological functionality and -integrity of the local watershed and broader quaternary surface water catchment and drainage area (hydrocarbons, other chemicals, surface material/soil erosion as well as slight fugitive dust generation, emissions and fallout)
- Contamination of soil and groundwater resources (hydrocarbons and other chemicals)

The local and broader surrounding landscape is earmarked for residential expansion of the city. It is therefore highly likely that further similar pipeline network development and subsequent transformation would take place throughout the local area, which would lead to further cumulative impacts.

If unmitigated, the significant potential long-term aquatic ecological receptor impacts identified for the proposed development (see section 8.1), could potentially merely add low cumulative impact to the existing negative impacts associated with the extensive existing residential, industrial and commercial transformation associated with the city as well as historical and currently active agricultural cropland cultivation transformation throughout the local and broader surrounding landscape. This local surrounding landscape is furthermore also highly transformed and fragmented, from an ecological connectivity, -functionality and -integrity perspective. The narrow temporary linear size of the study area is also minute relative to the portions of undeveloped reasonably natural habitat and disturbance is merely temporary in nature.

It is the opinion of the specialist, by application of the NEMA Mitigation Hierarchy, that all the identified potential cumulative aquatic ecological receptor impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended mitigation measures (see section 8.3). It is therefore not anticipated that the proposed development will add any significant residual cumulative aquatic ecological receptor impacts to the surrounding environment, if all recommended mitigation measures as per this aquatic ecological report (see section 8.3) are adequately implemented and managed, for both the construction- and subsequent operational phases of the proposed development.

Trench excavation, pipeline placement and subsequent trench backfilling at the proposed watercourse crossings must be conducted concurrently, in order to ensure continued flow through the area during the construction period. Under no circumstances may the flow of the watercourses be significantly impeded/blocked for any period of time, during construction.

Materials excavated from the proposed pipeline trench at the proposed watercourse crossings must be adequately placed/stockpiled outside the watercourse extents on the upstream side of the trench, before being backfilled into the trench after pipeline placement. This must be done in order to prevent any significant surface material/soil contamination of the watercourses.

Trench excavation, pipeline placement and subsequent trench backfilling at the proposed watercourse crossings must be conducted manually underneath the riparian woodland- and woody thicket canopies and no trees may be removed, as far as practicably possible/feasible. This must be done in order to prevent any significant damage destruction of the riparian woodland- and woody thicket habitats.

Virtually the entire proposed development footprint is confirmed to be of 'low' Aquatic Biodiversity Theme sensitivity (including aquatic plant and -animal species), while the identified significant third-order- and easterly situated second-order seasonal streams to be crossed are rated as being of 'medium' Aquatic Biodiversity Theme sensitivity. No potential aquatic ecological fatal flaws were identified for the proposed development. It is therefore the opinion of the specialist from an aquatic ecological perspective, that the proposed development can be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigation measures as per this aquatic ecological report (see section 8.3) must however be adequately implemented and managed for both the construction- and subsequent operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.



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Qualifications

- M.Env.Sci Ecological Remediation and Sustainable Utilisation/Vegetation Ecology
 - 2011 - North West University Potchefstroom
- B.Sc Botany and Zoology (Cum Laude)
 - 2009 - North West University Potchefstroom

Accredited Courses Completed

- Implementing Environmental Management Systems ISO 14001
 - 2011 - North West University Potchefstroom
- Environmental Law for Environmental Managers
 - 2011 - North West University Potchefstroom
- SASS 5 Aquatic Biomonitoring Training Course
 - 2017 – GroundTruth Consulting
- Tools for Wetland Assessment
 - 2023 – GroundTruth Consulting
- Introduction to Wetland Assessments
 - 2023 – GroundTruth Consulting

Professional Registrations

- South African Council for Natural Scientific Professions (**SACNASP**)
 - Professional Ecological Scientist Registration number 115601
- International Association for Impact Assessment (**IAIA**)
 - Registration number 5232
- South African Green Industries Council (**SAGIC**) Invasive Species training
 - Registration number 2405/2459
- South African Wetland Society (**SAWS**)
 - Membership number 220958

Employment and Experience

March 2011 - October 2011

Upon completion of his studies, Rikus started his career in 2011 as an **Environmental Professional in Training (PIT) at Anglo American Thermal Coal: Environmental Services**. He received environmental training and practical implementation experience in all environmental facets of the mining industry with the focus on: Environmental rehabilitation, land management (biodiversity and invasive species eradication), waste & water-, air quality-, game reserve-, environmental management and legislation, as well as corporate reporting. He was also appointed as the Biodiversity Management Custodian at Anglo American Thermal Coal collieries.

November 2011 - November 2015

He was then employed by **Fraser Alexander Tailings as an Environmental Contracts Manager**, where he was responsible for the technical and operational management of all Fraser Alexander Tailings' mining environmental rehabilitation projects. He was responsible for implementation of rehabilitation- and environmental strategies as well as all facets/entire business value chain of project management.

He conducted a significant amount of quantitative and qualitative ecological vegetation monitoring during his employment period with the company. Such monitoring mainly included environmentally rehabilitated mining areas in the open-cast coal-, gold-, platinum- and chrome mining industries situated in the Free State, Gauteng, Mpumalanga, North-West and Limpopo Provinces. He was involved with analysis, processing and interpretation of environmental monitoring data and compilation of high quality technical/scientific environmental monitoring reports for clients. He was subsequently further involved with providing adequate ecological management and maintenance recommendations for rehabilitated areas. He also provided technical/scientific environmental rehabilitation support to mining clients, with regards to sufficient soil preparation and amelioration, grassing processes, as well as grass species mixtures and ratios.

January 2016 - May 2017

He was then employed by **Enviroworks Consulting as a Senior Ecological Specialist** where he was responsible for all Terrestrial and Aquatic Ecological Specialist Assessments and reporting related to Environmental Impact Assessment (EIA) and Basic Assessment (BA) projects. He also completed numerous EIA and BA projects as the main project Environmental Assessment Practitioner (EAP).

June 2017 - Present

Rikus then subsequently established the company EcoFocus Consulting (Pty) Ltd as the owner and Managing Director, which provides high quality professional environmental and ecological specialist services and solutions to the industrial-, construction-, mining-, agricultural-, renewable energy- and other sectors.

He possesses significant qualifications, vast knowledge, skills as well as technical and practical experience in the project management and environmental specialist fields. This, coupled with his disciplined, determined, innovative, goal-driven and solution-oriented mindset as well as exceptional problem-solving-, communication- and people skills along with his high level of personal standards, ensure high quality, timely and outcomes-based outputs and service delivery relating to any project.

Ecological & Wetland Specialist Assessment & Report Completion for the last two years

2026

- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 107 ha Prieska Power Reserve Doringberg PV Solar Energy Facility Development, Prieska, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 129 ha Farm No. 2727 Residential Development, Bloemfontein, Free State Province.
- Aquatic Ecological Impact Assessment Review for the proposed 12.8 km Khauta South 132 kV Overhead Powerline Development, Riebeeckstad, Free State Province.
- Terrestrial Vegetation Desktop Site Sensitivity Screening Assessment for the proposed 23 786 ha Morgenzon Wind Energy Facility Development, Mpumalanga Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 0.97 ha Brandkop Reservoir Development, Bloemfontein, Free State Province.

- Plant Species-, Rehabilitation-, Soil Erosion- and Alien Invasive Species Management Plan for the proposed 10.2 ha Arbor Acres Poultry Broiler House Development, Dealesville, Free State Province.
- Watercourse/Wetland Assessment Report for the proposed 108 ha Gamsberg Zinc Mine Phase 2 Tailings Storage Facility and Associated Infrastructure Development, Aggeneys, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 108 ha Gamsberg Zinc Mine Phase 2 Tailings Storage Facility and Associated Infrastructure Development, Aggeneys, Northern Cape Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 5.4 ha Farm Die Vlakte No. 731 Poultry Broiler House Development, Boshof, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 5.4 ha Farm Die Vlakte No. 731 Poultry Broiler House Development, Boshof, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 11.55 ha Farm No. 406 Piggery Expansion, Heilbron, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 11.55 ha Farm No. 406 Piggery Expansion, Heilbron, Free State Province.
- Aquatic Ecological Impact Assessment Review for the proposed 165 MW Khauta North Solar PV Facility BESS and O&M Building Development, Riebeeckstad, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 17.5 ha Ladybrand Wastewater Treatment Works (WWTW) Upgrade, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 17.5 ha Ladybrand Wastewater Treatment Works (WWTW) Upgrade, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 5.95 ha Askham Cemetery Expansion, Northern Cape Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 15.3 ha Louisvale Cemetery Expansion, Upington, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 15.3 ha Louisvale Cemetery Expansion, Upington, Northern Cape Province.

- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 71.6 ha Greyling Broers Trust Agricultural Development, Windsorton, Northern Cape Province.
- Aquatic Biodiversity Theme SSV & Compliance Statement for the proposed Mapoteng Water Reticulation Development, Kuruman, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed Mapoteng Water Reticulation Development, Kuruman, Northern Cape Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 4.31 ha Botshabelo-L Extension Residential Development, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 4.31 ha Botshabelo-L Extension Residential Development, Free State Province.

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- Aquatic Ecological Compliance Statement for the proposed Obed Nkosi Residential and Attenuation Pond Development, Heidelberg, Gauteng Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed Obed Nkosi Residential and Attenuation Pond Development, Heidelberg, Gauteng Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 1 200 m² Erf 2103 Upington Single Residential Development, Northern Cape Province.
- Aquatic Ecological Compliance Statement for the proposed 990 m and 0.23 ha Nala Local Municipality Pipeline and Pumping Station Development, Bothaville, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 990 m and 0.23 ha Nala Local Municipality Pipeline and Pumping Station Development, Bothaville, Free State Province.
- Grazing and Invasive Species Follow-up Assessment for the Farm Retieffs Nek No. 123 outside Bethlehem, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes Compliance Statement for the proposed 5.84 ha Modder Rivier Truckstop Development, Northern Cape Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes Specialist Assessment Report for the proposed 462 ha Manoke Residential Development, Burgersfort, Limpopo Province.

- Terrestrial- as well as Plant- and Animal Species Themes Site Sensitivity Verification Report for the proposed 800 ha Seriti Green (Pty) Ltd Middelburg Mine Services (MMS) Solar PV Energy Facility Northern Portion Development, eMalahleni, Mpumalanga Province.
- Terrestrial- as well as Plant- and Animal Species Themes Site Sensitivity Verification Report for the proposed 510 ha Seriti Green (Pty) Ltd Middelburg Mine Services (MMS) Solar PV Energy Facility Southern Portion Development, eMalahleni, Mpumalanga Province.
- Terrestrial- as well as Plant- and Animal Species Themes Site Sensitivity Verification Reports for the proposed 17.4 km Seriti Green (Pty) Ltd Middelburg Mine Services (MMS) Overhead Powerline North Options A & B Developments, eMalahleni, Mpumalanga Province.
- Terrestrial- as well as Plant- and Animal Species Themes Site Sensitivity Verification Reports for the proposed 7.12 km Seriti Green (Pty) Ltd Middelburg Mine Services (MMS) Overhead Powerline Olifants Grid Northern Exit, South A & South B Developments, eMalahleni, Mpumalanga Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 600 m Jagersfontein Road and Bridge Watercourse Crossing Development, Free State Province.
- Ecological Re-vegetation and Alien Invasive Species Management Plan for the proposed Nketoana Local Municipality Existing Waste Water Treatment Works Decommissioning, Lindley, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 29.6 ha Hoopstad Cemetery Development, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 29 ha Bultfontein Cemetery Development, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 43.2 ha Witho Developers Upington Residential Development, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 64.6 ha Phaliso Residential Development, Trompsburg, Free State Province.
- Aquatic Biodiversity Theme SSV & Compliance Statement for the proposed 78.7 km 386 Phetogo - Welbedacht Pipeline Development, Dewetsdorp, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 78.7 km 386 Phetogo - Welbedacht Pipeline Development, Dewetsdorp, Free State Province.

- Aquatic Biodiversity Theme SSV & Compliance Statement for the proposed 643 ha and 9.3 km Sol Platz Solar PV Facility with Battery Energy Storage System, Electrical Grid Connection, and Associated Infrastructure Development, Bloemfontein, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 643 ha and 9.3 km Sol Platz Solar PV Facility with Battery Energy Storage System, Electrical Grid Connection, and Associated Infrastructure Development, Bloemfontein, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 13 ha AHB Logistix Upington Truckstop Expansion, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 153 ha 322 Majwemasweu Township Development, Brandfort, Free State Province.
- Indigenous species list for the proposed Riverton Water Treatment Works (WTW) Perimeter Fenceline Development, Northern Cape Province.
- National Water Act (Act 36 of 1998) Section 21 C & I Water Use Letter for the proposed Kathu Waste Handling Facility Transfer Station Development, Northern Cape Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 18 ha Springbokvlakte Coldmix Plant Development, Bela-Bela, Limpopo Province.
- Aquatic Biodiversity Theme SSV & Compliance Statement for the proposed 880 m Smaldeel Road Upgrade, Kroonstad, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 15.3 ha Ribblesdale Industrial Park Development, Bloemfontein, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 10.6 ha Ribblesdale Borrow Pit Development, Bloemfontein, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 10.4 ha Holtzhuisfontein Borrow Pit Development, Bloemfontein, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 29.6 ha Hoopstad Cemetery Development, Free State Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 7 ha Olyvenshouts Drift Settlement Raisin Drying Facility, Upington, Northern Cape Province.

- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 8.1 ha Olyvenshouts Drift Settlement Raisin Drying Facility NEMA Section 24G, Upington, Northern Cape Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 47.6 ha Brandfontein Feedlots Expansion, Burgersdorp, Eastern Cape Province.
- Terrestrial- and Aquatic Biodiversity- as well as Plant- and Animal Species Themes SSV & Compliance Statement for the proposed 10.2 ha Holtzhuisfontein Borrow Pit Development, Bloemfontein, Free State Province.
- Aquatic Ecological Impact Assessment Review for the proposed 101 ha Khauta West 80 MW Solar PV Energy Facility Development, Riebeeckstad, Free State Province.
- Terrestrial Biodiversity- as well as Plant- and Animal Species Themes SSV & Specialist Assessment Report for the proposed 209.41 ha Beginsel Agriculture Estate Development, Clarens, Free State Province.
- Watercourse/Wetland Assessment Report for the proposed 9 ha Barkly West Wastewater Treatment Works (WWTW) Refurbishment, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 9 ha Barkly West Wastewater Treatment Works (WWTW) Refurbishment, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 47.6 ha Brandfontein Feedlots Expansion, Burgersdorp, Eastern Cape Province.
- Desktop Site Sensitivity Maps for the proposed refurbishment of Moeding WWTW and 10 Pump Stations, Phuthaditjhaba, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix review for the proposed 7.22 ha Welgegund Borrow Pit Development, Excelsior, Free State Province.
- Watercourse/Wetland Assessment Report for the proposed 9.1 ha Utopia Gas Depot & Light Industrial Development, Bethlehem, Free State Province.
- Water Use License Application (WULA) Risk Assessment Matrix for the proposed 9.1 ha Utopia Gas Depot & Light Industrial Development, Bethlehem, Free State Province.
- Aquatic Biodiversity Theme SSV & Specialist Assessment Report for the proposed 262 ha 434 Orange River Solar Facility 1 Associated Infrastructure Development, Groblershoop, Northern Cape Province.