

Ecological Assessment

Report

Nketoana Local Municipality Waste

Water Treatment Works

Development, Lindley, Free State

Province

May 2023

Compiled for:



Compiled by:

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Executive Summary

The project applicant, Nketoana Local Municipality, proposes to develop a Waste Water Treatment Works (WWTW), approximately 1 km north-west of the township of Ntha. The township is situated directly adjacent west of the town of Lindley, Free State Province. The proposed development will consist of the following:

- WWTW
- Access road
- Sewage pipeline from the township

NSVT Consultants was appointed by the applicant as the independent Environmental Assessment Practitioner (EAP), to conduct the legally required Basic Assessment (BA) process.

Due to the nature of potential ecological impacts posed by the proposed development to the local ecosystem and ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically sensitive/conservationally significant areas, plant-, faunal- and avifaunal species as well as significant watercourses and/or wetlands and/or other aquatic ecological features/habitats, which may be adversely affected by the proposed development.

Potential ecological impacts posed by the proposed development to the local ecosystem and ecology, must be identified, evaluated, rated and discussed. Impact 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 ecological impacts associated with the proposed development.

EcoFocus Consulting was therefore consequently appointed by the EAP as the independent ecological specialist, to conduct the required Ecological study for the proposed development. This report constitutes the Ecological Assessment.

Date of Ecological Site Assessment

A site assessment of the proposed development area was conducted on 02 May 2023. This date forms part of the commencement of the winter season. It must therefore be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals. It is therefore recommended that an additional ecological walkthrough be conducted during the flowering period of underground bulb plant species, prior to the commencement of the proposed development. This will ensure that no provincially protected or other conservationally significant plant species have potentially been omitted.

Methodology

The assessment area was assessed on foot in a grid formation. Visual observations/identifications were made of general terrestrial botanical/vegetation habitats and their conditions as well as any ecologically sensitive/conservationally significant areas/habitats within the assessment area. Visual observations/identifications were made of general and conservationally significant plant species encountered within the assessment area. Identified plant species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), 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. A desktop assessment was conducted of conservationally significant faunal and avifaunal species which can potentially be encountered within the assessment area.

Significant watercourses and/or wetlands and/or other aquatic ecological features/habitats were identified, delineated and discussed as per the accepted methodology, if potentially found to be present within the assessment area.

Georeferenced photographs were taken of any Red Data Species Listed-, nationally- or provincially protected plant species, ecologically sensitive/conservationally significant areas as well as significant watercourses and/or wetlands and/or other aquatic ecological features/habitats, if encountered within the assessment area. This was done in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

The Site Ecological Importance (SEI), Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) as well as Recommended Ecological Category (REC) of the assessment area were determined and discussed.

Potential ecological impacts posed by the proposed development to the local ecosystem and ecology, were identified, evaluated, rated and discussed.

Assessment Area

The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The assessment area is situated approximately 1 km north-west of the township of Ntha. The township is situated directly adjacent west of the town of Lindley, Free State Province. The assessment area is situated on the Remaining Extent of the Farm Brandhoek No. 19 (SG 21 Digit Code: F0220000000001900000). The area forms part of the Nketoana Local Municipality which in turn, forms part of the Thabo Mufutsanyane District Municipality.

The assessment area falls outside the municipal urban edge. Access to the assessment area is obtained by way of an existing dirt road from the east.

Conclusion

The watercourse and associated floodplain scored a low Ecological Importance and Sensitivity (EIS) and is merely viewed as being of low overall conservational significance/value.

The seepage wetland scored a moderate Ecological Importance and Sensitivity (EIS) and is viewed as being of moderate overall conservational significance/value.

The assessment area scored a low-medium Site Ecological Importance (SEI) value and is viewed as being of low to moderate overall conservational significance/value for habitat preservation and continued ecological functionality and -integrity persistence in support of the surrounding ecosystem, broader vegetation type as well as faunal and avifaunal habitats.

Transformation of vegetation within the assessment area associated with the Central Free State Grassland vegetation type (Gh 6) was identified and addressed as the only significant potential long-term ecological impact, associated with the construction phase of the proposed development.

Sewage contamination of the watercourse and associated floodplain, seepage wetland, Vals River as well as groundwater resources was furthermore identified and addressed as the only significant potential long-term ecological impact, associated with the operational phase of the proposed development.

The significant potential long-term ecological impacts identified for the proposed development, could potentially add low to moderate cumulative impact to the existing negative impacts caused by the extensive existing residential transformation associated with the township and town, to the east of the assessment area.

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

It is the opinion of the specialist that the proposed development of the assessment area should be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigation measures as per this ecological report 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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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
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
PES	Present Ecological State
REC	Recommended Ecological Category
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SEI	Site Ecological Importance
WULA	Water Use License Application
WWTW	Waste Water 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), NSVT Consultants, 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 Purchase Order terms of reference
- 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, Nketoana Local Municipality, proposes to develop a Waste Water Treatment Works (WWTW), approximately 1 km north-west of the township of Ntha. The township is situated directly adjacent west of the town of Lindley, Free State Province. The proposed development will consist of the following:

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Due to the nature of potential ecological impacts posed by the proposed development to the local ecosystem and ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically sensitive/conservationally significant areas, plant-, faunal- and avifaunal species as well as significant watercourses and/or wetlands and/or other aquatic ecological features/habitats, which may be adversely affected by the proposed development.

Potential ecological impacts posed by the proposed development to the local ecosystem and ecology, must be identified, evaluated, rated and discussed. Impact 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 ecological impacts associated with the proposed development.

EcoFocus Consulting was therefore consequently appointed by the EAP as the independent ecological specialist, to conduct the required Ecological study for the proposed development. This report constitutes the Ecological Assessment.

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

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

2. Date of Ecological Site Assessment

A site assessment of the proposed development area was conducted on 02 May 2023. This date forms part of the commencement of the winter season. It must therefore be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals. It is therefore recommended that an additional ecological walkthrough be conducted during the flowering period of underground bulb plant species, prior to the commencement of the proposed development. This will ensure that no provincially protected or other conservationally significant plant species have potentially been omitted.

3. Assessment Rational

South Africa is a country rich in natural resources and splendour and is rated as having some of the highest biodiversity in the world. Other than the pure aesthetic value which our biodiversity and natural resources provides, it also plays a significant positive role in our national economy. While continuous economic development and progress is a key national focus area, which forms a cornerstone in the socio-economic improvement of society and the livelihoods of communities and individuals, the preservation and management of the integrity and sustainability of our natural resources is also essential in achieving this objective.

Socio-economic development and progress can therefore not be completely inhibited for the sake of ensuring environmental conservation; solutions and compromises rather need to be explored in order to achieve the need for socio-economic development without unreasonably jeopardising the needs of environmental conservation. A sustainable and responsible balance needs to be maintained in order to accommodate the requirements of both.

Adequate, sustainable and responsible utilisation and management of our natural resources is crucial. Finding the required balance between socio-economic development and environmental conservation, should therefore always be a priority focus point during any proposed development process.

Various environmental legislation in South Africa makes provision for the protection of our natural resources and the functionality of ecological systems in order to ensure sustainability. Such acts include the National Environmental Management: Biodiversity Act (Act 10 of 2004), National Forests Act (Act 84 of 1998), Conservation of Agricultural Resources Act (Act 43 of 1983), National Water Act (Act 36 of 1998) and framework legislation such as the National Environmental Management Act (Act 10 of 2004).

An Ecological Assessment of the proposed development area was therefore conducted in order to identify and quantify any potential ecological impacts, associated with the proposed development.

4. Objectives of the Assessment

- Describe the general terrestrial botanical/vegetation habitats within the assessment area and identify and list conservationally significant plant species encountered within the assessment area.
 - List any nationally- and/or provincially protected- and/or Red Data Listed plant species.
- Identify and discuss any ecologically sensitive/conservationally significant areas/habitats, if potentially found to be present within the assessment area.
- Conduct a desktop assessment of conservationally significant faunal and avifaunal species which can potentially be encountered within the assessment area.
- Assess and discuss the Site Ecological Importance (SEI) of the assessment area and directly surrounding areas, in order to provide an indication of the overall ecological conservational significance/value of the assessment area.
- Identify, delineate and discuss any significant watercourses and/or wetlands and/or other aquatic ecological features/habitats, if potentially found to be present within the assessment area.
 - Assess and discuss the simplified Present Ecological State (PES) of all such identified significant aquatic features associated with the assessment area and directly surrounding areas. This must be done in order to provide an indication of the current ecological condition as well as the extent and severity of degradation and/or transformation of the aquatic features, if applicable.
 - Assess and discuss the Ecological Importance and Sensitivity (EIS) of all such identified significant aquatic features associated with the assessment area and directly surrounding areas. This must be done in order to provide an indication of the ecological sensitivity/conservational significance/value of the aquatic features, if applicable.
- Identify, evaluate, rate and discuss any potential ecological impacts associated with the proposed development.
 - Provide recommendations on impact mitigation and management measures in accordance with the requirements of the NEMA (Act 107 of 1998) Mitigation Hierarchy, in order to attempt to reduce/alleviate the adverse effects of identified potential ecological impacts.
- Provide recommendations on the ecological suitability/acceptability of the assessment area for the proposed development.
- A digital report (this document) as well as digital .KML files will be provided to the EAP, of any identified ecologically sensitive/conservationally significant areas and/or significant watercourses and/or wetlands and/or other aquatic ecological features/habitats, if potentially found to be present within the assessment area.

5. Methodology

- The assessment area was assessed on foot in a grid formation.
- Visual observations/identifications were made of general terrestrial botanical/vegetation habitats and their conditions as well as any ecologically sensitive/conservationally significant areas/habitats within the assessment area.
- Visual observations/identifications were made of general and conservationally significant plant species encountered within the assessment area.
 - Identified plant species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), 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.
- A desktop assessment was conducted of conservationally significant faunal and avifaunal species which can potentially be encountered within the assessment area.
 - The Virtual Museum and the IUCN Red List of Threatened Species were used for the desktop assessment.
 - The likelihood was discussed of identified faunal and avifaunal species utilising the terrestrial botanical/vegetation habitats and significant aquatic ecological features/habitats within the assessment area as refuge or for breeding, foraging and/or persistence purposes.
 - No actual on-site trapping, sampling or specifically focused assessments of any faunal or avifaunal species was conducted.
 - Faunal and avifaunal species encountered during the site visit were however noted and discussed.

The **Site Ecological Importance (SEI)** of the assessment area was determined and discussed as per the tables below.

- 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 1: Criteria for CI calculations

Conservation Importance	Fulfilling Criteria
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Very High	<p>Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km².</p> <p>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.</p> <p>Globally significant populations of congregatory species (> 10% of global population).</p>
High	<p>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.</p> <p>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.</p> <p>Presence of Rare species.</p> <p>Globally significant populations of congregatory species (> 1% but < 10% of global population).</p>
Medium	<p>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.</p> <p>Any area of natural habitat of threatened ecosystem type with status of VU.</p> <p>Presence of range-restricted species.</p> <p>> 50% of receptor contains natural habitat with potential to support SCC.</p>
Low	<p>No confirmed or highly likely populations of SCC.</p> <p>No confirmed or highly likely populations of range-restricted species.</p> <p>< 50% of receptor contains natural habitat with limited potential to support SCC.</p>
Very Low	<p>No confirmed and highly unlikely populations of SCC.</p> <p>No confirmed and highly unlikely populations of range-restricted species.</p> <p>No natural habitat remaining.</p>

Table 2: Criteria for FI calculations

Functional Integrity	Fulfilling Criteria
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Very High	<p>Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types.</p> <p>High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.</p> <p>No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing).</p>
High	<p>Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types.</p> <p>Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches.</p> <p>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.</p>
Medium	<p>Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types.</p> <p>Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches.</p> <p>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.</p>
Low	<p>Small (> 1 ha but < 5 ha) area.</p> <p>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.</p> <p>Several minor and major current negative ecological impacts.</p>
Very Low	<p>Very small (< 1 ha) area.</p> <p>No habitat connectivity except for flying species or flora with wind-dispersed seeds.</p> <p>Several major current negative ecological impacts.</p>

Table 3: 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 4: Criteria for RR calculations

Receptor Resilience	Fulfilling Criteria
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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 5: 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 6: 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.

- 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 assessment area.
 - 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 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 the wetland temporary zone, was designated as sensitive in a sensitivity map. The guidelines stipulate buffers to be delineated around the boundary of a wetland. An adequate protective buffer zone, beginning from the outer edge of the wetland temporary zone, was implemented and designated as sensitive within which no development must be allowed to occur.
- Georeferenced photographs were taken of any Red Data Species Listed-, nationally- or provincially protected plant species, ecologically sensitive/conservationally significant areas as well as significant watercourses and/or wetlands and/or other aquatic ecological features/habitats, if encountered within the assessment area. 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 assessment area was determined and discussed as per the table below.

- 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 7: 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 assessment area was determined and discussed as per the table below.

- 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 8: 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 assessment area 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.

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 ecological impacts posed by the proposed development to the local ecosystem and ecology, were identified, evaluated, rated and discussed as per the methodology described below. The tables below indicate and explain the methodology and criteria used for the evaluation of the Environmental Risk Ratings as well as the calculation of the final Environmental Significance Ratings of the identified potential ecological impacts. Each identified potential ecological impact is scored for each of the Evaluation Components, as per the table below.

Table 9: Criteria for Environmental Risk Rating calculations

Evaluation Component	Rating Scale and Description/Criteria
Magnitude of Negative or Positive Impact	<p>10 - Very high: Bio-physical features and/or ecological functionality/processes may be severely impacted upon.</p> <p>8 - High: Bio-physical features and/or ecological functionality/processes may be significantly impacted upon.</p> <p>6 - Medium: Bio-physical features and/or ecological functionality/processes may be moderately impacted upon.</p> <p>4 - Low: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon.</p> <p>2 - Very Low: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon.</p> <p>0 - Zero: Bio-physical features and/or ecological functionality/processes will not be impacted upon.</p>
Duration of Negative or Positive Impact	<p>5 – Permanent: Impact will continue on a permanent basis.</p> <p>4 - Long term: Impact should cease a period (> 40 years) after the operational phase/project life of the activity.</p> <p>3 - Medium term: Impact may occur for the period of the operational phase/project life of the activity.</p> <p>2 - Short term: Impact may only occur during the construction phase of the activity after which it will cease.</p> <p>1 - Immediate: Impact may only occur as a once off during the construction phase of the activity.</p>
Extent of Positive or Negative Impact	<p>5 - International: Impact will extend beyond National boundaries.</p> <p>4 - National: Impact will extend beyond Provincial boundaries but remain within National boundaries.</p> <p>3 - Regional: Impact will extend beyond 5 km of the development footprint but remain within Provincial boundaries.</p> <p>2 - Local: Impact will not extend beyond 5 km of the development footprint.</p> <p>1 - Site-specific: Impact will only occur on or within 200 m of the development footprint.</p> <p>0 – No impact.</p>
Irreplaceability of Natural Resources being impacted upon	<p>5 – Definite loss of irreplaceable natural resources.</p> <p>4 – High potential for loss of irreplaceable natural resources.</p> <p>3 – Moderate potential for loss of irreplaceable natural resources.</p> <p>2 – Low potential for loss of irreplaceable natural resources.</p> <p>1 – Very low potential for loss of irreplaceable natural resources.</p> <p>0 – No impact.</p>

Reversibility of Impact	<p>5 – Impact cannot be reversed.</p> <p>4 – Low potential that impact may be reversed.</p> <p>3 – Moderate potential that impact may be reversed.</p> <p>2 – High potential that impact may be reversed.</p> <p>1 – Impact will be reversible.</p> <p>0 – No impact.</p>
Probability of Impact Occurrence	<p>5 - Definite: Probability of impact occurring is > 95 %.</p> <p>4 - High: Probability of impact occurring is > 75 %.</p> <p>3 - Medium: Probability of impact occurring is between 25 % - 75 %.</p> <p>2 - Low: Probability of impact occurring is between 5 % - 25 %.</p> <p>1 - Improbable: Probability of impact occurring is < 5 %.</p>
Cumulative Impact	<p>High: Numerous similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts.</p> <p>Medium: Few similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts.</p> <p>Low: Virtually no similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. The development is anticipated to be an isolated occurrence and should therefore have a negligible cumulative impact.</p> <p>None: No cumulative impact.</p>

Once the Environmental Risk Ratings have been evaluated for each identified potential ecological impact, the Significance Score of each impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**
- **The maximum Significance Score value is 150.**

The Significance Score is then used to rate the Environmental Significance of each identified potential ecological impact, as per Table 4 below. The Environmental Significance rating process is completed for all identified potential ecological impacts for the construction- and subsequent operational phases of the proposed development, both before and after implementation of the recommended mitigation measures.

Table 10: Interpretation of Environmental Significance Rating calculation results

Environmental Significance Score	Environmental Significance Rating	Description/Criteria
125 – 150	Very High	An impact of very high significance after mitigation will mean that the development may not take place. The impact cannot be suitably reduced and mitigated to within acceptable levels.
100 – 124	High	An impact of high significance after mitigation should influence a decision about whether or not to proceed with the development. Additional, impact-specific mitigation measures must be implemented if the continuation of the development is to be considered.
75 – 99	Medium-High	Additional, impact-specific mitigation measures must be implemented for an impact of medium-high significance if the continuation of the development is to be considered.
50 – 74	Medium	An impact of medium significance after mitigation must be adequately managed in accordance with the mitigation measures provided by the specialist.
< 50	Low	If any mitigation measures are provided by the specialist for an impact of low significance after mitigation, the impact must be adequately managed in accordance with these measures.
+	Positive impact	A positive impact is likely to result in a beneficial consequence/effect and should therefore be viewed as a motivation for the development to proceed.

6. Assessment Area

The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The assessment area is situated approximately 1 km north-west of the township of Ntha. The township is situated directly adjacent west of the town of Lindley, Free State Province. The assessment area is situated on the Remaining Extent of the Farm Brandhoek No. 19 (SG 21 Digit Code: F0220000000001900000). The area forms part of the Nketoana Local Municipality which in turn, forms part of the Thabo Mufutsanyane District Municipality.

The assessment area falls outside the municipal urban edge. Access to the assessment area is obtained by way of an existing dirt road from the east.

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

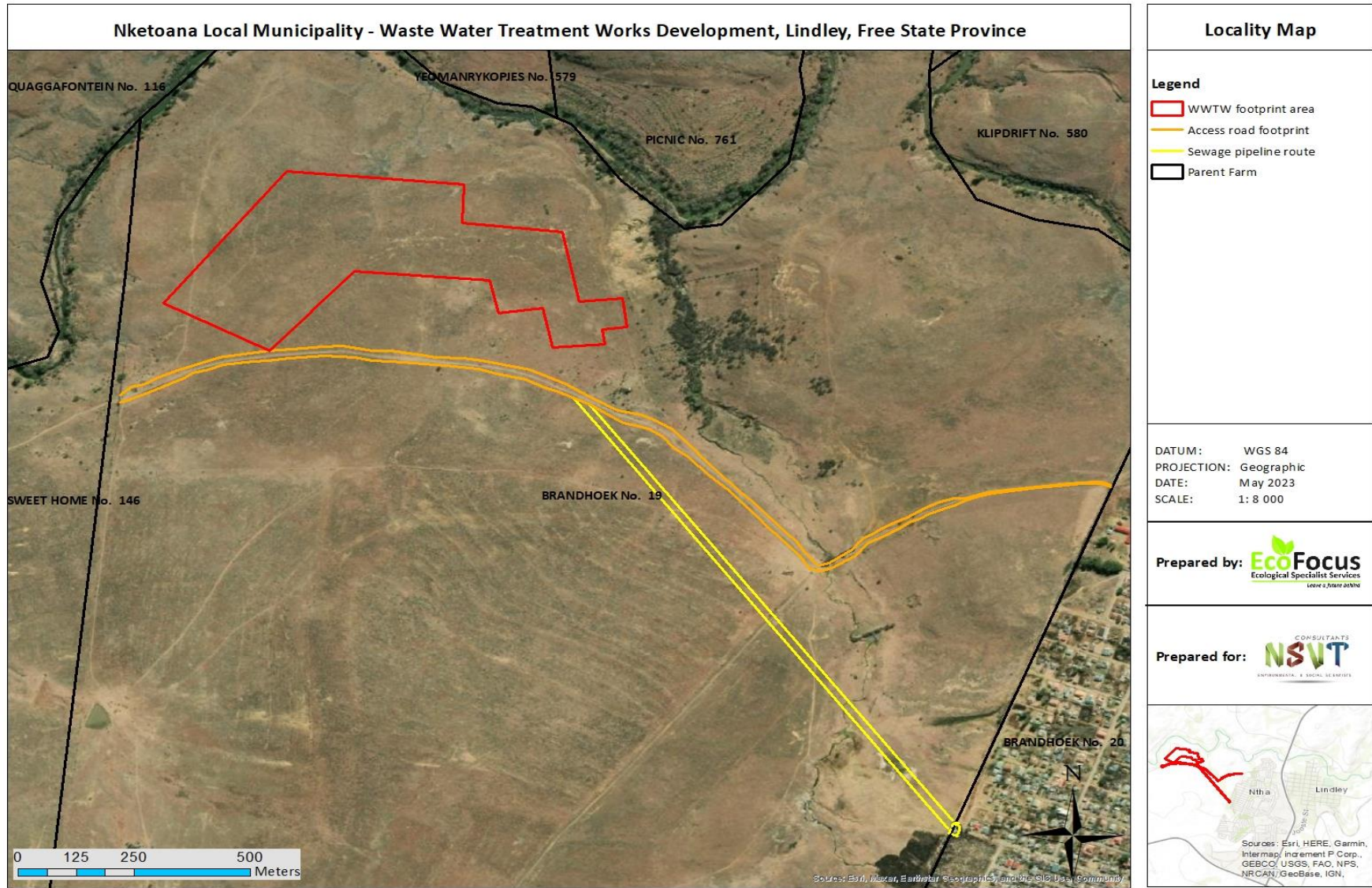


Figure 1: Locality map illustrating the assessment area

6.1. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 849 mm (www.climate-data.org). The maximum average monthly temperature is approximately 19.4°C in the summer months while the minimum average monthly temperature is approximately 9.3°C during the winter (www.climate-data.org). Maximum daily temperatures can reach up to 25.4°C in the summer months and dip to as low as 1.7°C during the winter (www.climate-data.org).

6.2. Geology and Soils

According to Mucina & Rutherford (2006) the geology of the landscape and associated vegetation type can be described as the following:

Sedimentary mudstones and sandstone mainly of the Adelaide Subgroup as well as those of the Ecca Group giving rise to vertic, melanic and red soils. Typical soil forms are Arcadia, Bonheim, Kroonstad, Valsrivier and Rensburg. Dc landtype dominates the landscape.

6.3. Vegetation Type and Conservation Status

Vegetation Type

According to SANBI (2006-2019), the entire assessment area falls within the Central Free State Grassland vegetation type (Gh 6), which mainly consists of undulating plains supporting short grassland dominated by *Themeda triandra* in natural conditions while *Eragrostis curvula* and *E chloromelas* become more dominant in degraded areas. Dwarf karoo bushes also establish in severely degraded clayey bottomlands (SANBI, 2006-2019). This vegetation type is classified as Least Concerned (SANBI, 2006-2019).

Conservation Status

Virtually the entire assessment area and broader surrounding landscape is categorised as Other Natural Area (ONA), according to the Free State Provincial Spatial Biodiversity Plan (Collins, 2018), which sets out biodiversity priority areas in the province.

A limited portion of the proposed sewage pipeline route however traverses Degraded land, according to the Free State Provincial Spatial Biodiversity Plan (Collins, 2018). This area constitutes an historically cultivated agricultural cropland.

According to the Environmental Screening Tool Report, the Terrestrial Biodiversity Theme of the assessment area is rated as being of 'low sensitivity'. The specialist is in agreement with this rating.

See vegetation type- and conservation status maps below (see A3 sized maps in the Appendices).



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

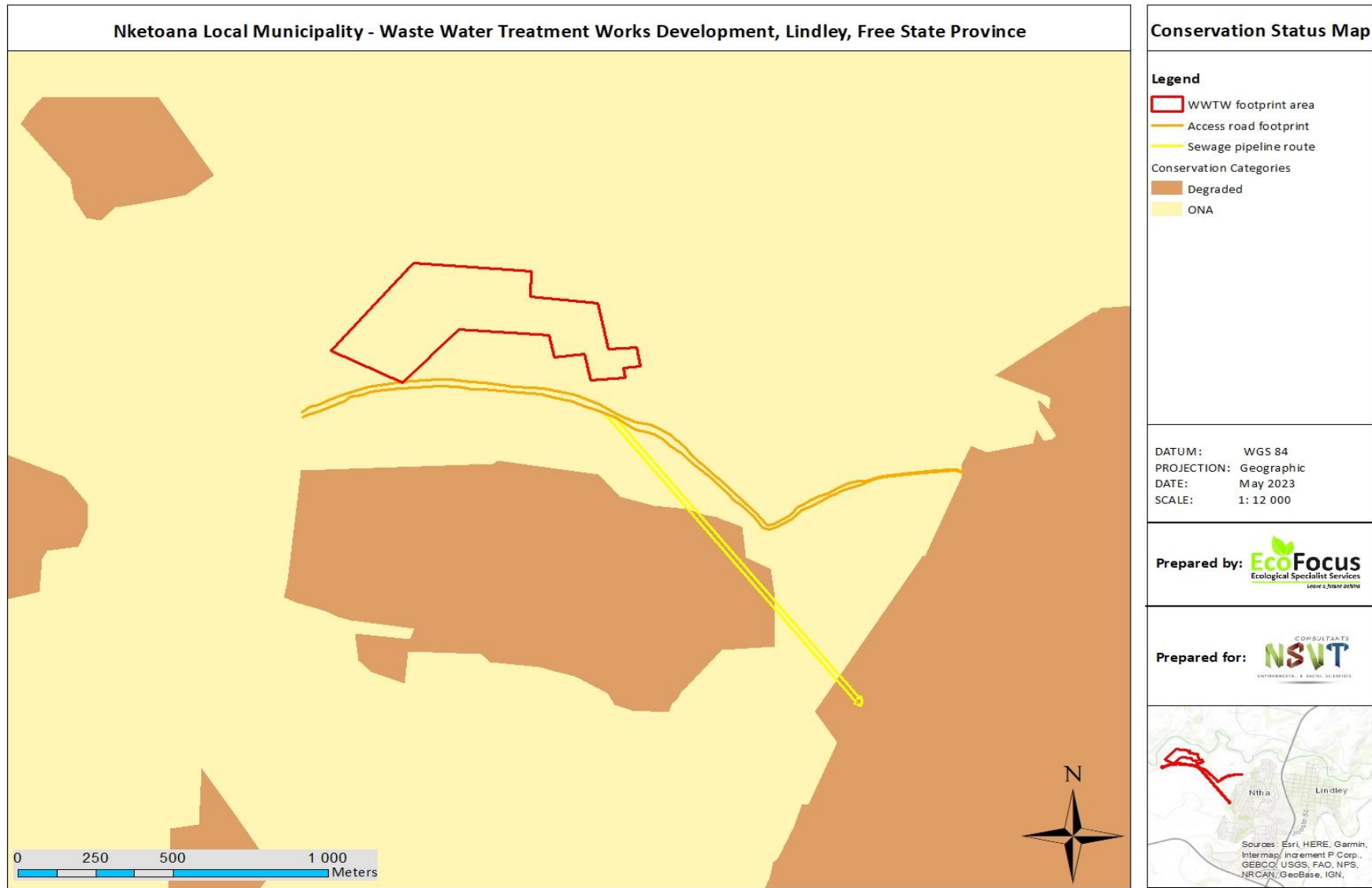


Figure 3: Conservation status map illustrating the conservation statuses/categories associated with the assessment area

7. 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 proposed development 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 Basic Assessment process, determined that the proposed development 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 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.
- the 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.
- 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 a BA involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the 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.
- Uncertainty of relevant decision making relates to the interpretation of provided information by relevant authorities during the 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 can be attributed to:

- The 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 ecological assessment.
- Extensive existing residential transformation associated with the township and town, is evident to the east of the assessment area.
- The local and broader landscape surrounding the assessment area however mainly constitutes undeveloped reasonably natural terrain.
- The potential for future similar developments in the same geographical area, which could lead to further cumulative impacts, cannot be meaningfully anticipated. It is however highly unlikely that further similar WWTW development and subsequent transformation will take place within the local and broader area, over time.

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.

8. Results and Discussion

8.1. Proposed Prospecting Area Clearance

The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The mechanical clearance and excavation associated with the proposed WWTW, will in all probability completely transform the majority of the existing surface vegetation and habitat throughout the footprint area.

The entire proposed access road constitutes an existing dirt road/farm track and the proposed development of the road will therefore not result in any significant additional vegetation clearance or habitat transformation.

The entire proposed sewage pipeline route will merely constitute a narrow linear clearance and excavation section of approximately ≤ 2 m in width. The mechanical clearance and excavation associated with the proposed pipeline, will in all probability merely transform the existing surface vegetation within this narrow linear section. It is however not anticipated that the proposed pipeline development will impact significantly wider.

Extensive existing residential transformation associated with the township and town, is evident to the east of the assessment area. The local and broader landscape surrounding the assessment area however mainly constitutes undeveloped reasonably natural terrain.

8.2. Aquatic Environment

8.2.1. Water Catchment and Drainage

The assessment area falls within the Middle Vaal Water Management Area (WMA 09) and the associated C60B quaternary surface water catchment- and drainage area. It is furthermore situated in the C60B - 2562 Sub Quaternary Reach (SQR), within the Highveld Ecoregion (11). The proposed WWTW footprint area and surrounding landscape generally flows in a northerly direction, towards the Vals River (see heading 8.2.2 below).

8.2.2. Watercourse Baseline Information

The Vals River flows past the proposed WWTW footprint area approximately 170 m to the north and continues in a westerly direction. The following baseline watercourse information and categorisation is applicable to the specific portion of the Vals River, which flows past the proposed WWTW footprint area, according to the latest South African National Biodiversity Assessment of 2018 (Van Deventer et al., 2019):

- River order = Second-order river
- Mainstem = 1 (quaternary mainstem)
- Flow = Permanent/perennial
- Geomorphic zone = Lower foothills
- River condition = Moderately Modified
- Present Ecological State (PES), 2018 = Class C (Moderately Modified)
- Ecosystem Threat Status (ETS), 2018 = Critically Endangered (CR)
- Ecosystem Protection Level (EPL), 2018 = Poorly Protected (PP)

It is therefore evident from a hydrological perspective, that the Vals River forms an important part of the local and broader quaternary surface water catchment- and drainage area, towards the west.

According to the National Freshwater Ecosystem Priority Areas Database (NFEPA, 2011), the portion of the C60B - 2562 Sub Quaternary Reach (SQR) associated with the assessment 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 specific portion of the Vals River which flows past the proposed WWTW footprint area or the local downstream region or are expected to specifically utilise this portion of the river as refuge or for breeding, foraging and/or persistence purposes.

According to the Environmental Screening Tool Report, the Aquatic Biodiversity Theme of the assessment area, is rated as being of 'low sensitivity'. The Aquatic Biodiversity Theme of the specific portion of the Vals River which flows past the proposed WWTW footprint area, is however rated as being of 'very high sensitivity'. The specialist is in agreement with these ratings.

It is however not anticipated that the proposed development would pose any significant risk to the continued flow or ecological functionality and -integrity of the specific portion of the Vals River or the associated local and broader quaternary surface water catchment- and drainage area.

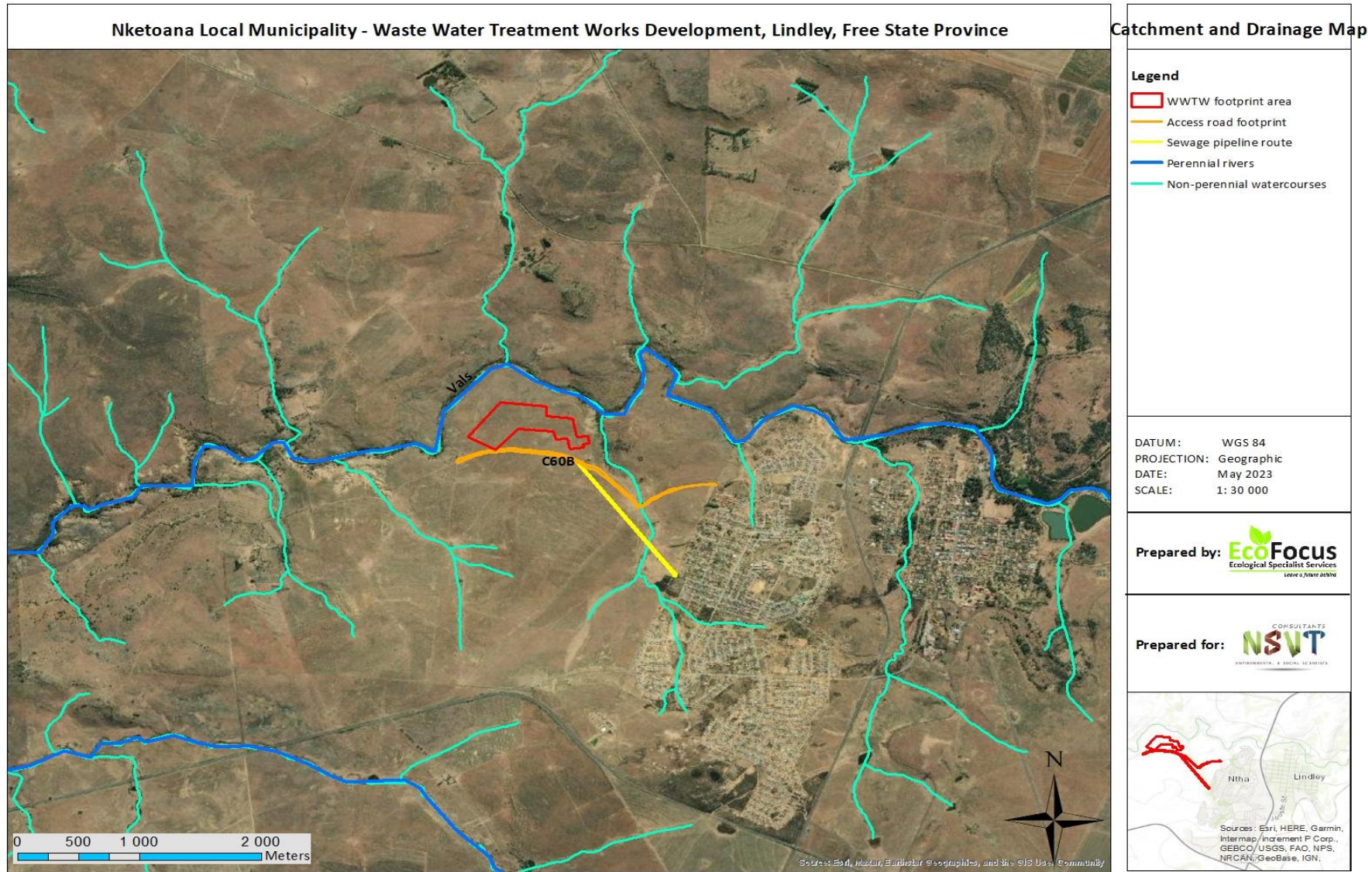


Figure 4: Water catchment and drainage map illustrating the main watercourses associated with the assessment area

8.2.3. Watercourses and Wetlands

Seasonal watercourse

A significant second-order seasonal watercourse and associated floodplain flows past the proposed WWTW footprint and discharges into the Vals River approximately 200 m east of the area. The proposed access road and sewage pipeline route will both traverse this watercourse and associated floodplain but at different locations. The watercourse commences within- and flows through the township and is in a highly polluted and degraded state, mainly as a result of significant historical and continued raw sewage discharge into the watercourse by the township. The smell of raw sewage is evidently present all along the length of the watercourse.

The watercourse and associated floodplain mainly constitute a broad disturbed but actively functional semi-aquatic habitat. The semi-aquatic habitat is mainly dominated by the hydrophytic grass species *Setaria incrassata* and *Eragrostis plana*, while the sedge species *Cyperus spp.* was also found to be present but to a significantly lesser extent.

No Red Data Listed-, nationally protected- or provincially protected plant species or any other plant species of conservational significance/value, were found to be present throughout the watercourse and associated floodplain. As stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals.

No conservationally significant or important avifaunal species/nests or other -faunal species were observed throughout the watercourse and associated floodplain, during the site assessment. Although the watercourse and associated floodplain provide locally distinct semi-aquatic habitat, which can be utilised by aquatic bird-, amphibian- and other aquatic faunal species, the area is subjected to continued anthropogenic activity and disturbance due to the close proximity of the township. It is therefore unlikely that any conservationally significant or important faunal or avifaunal species would specifically utilise the portion of the watercourse and associated floodplain associated with the proposed development, as refuge or for breeding, foraging and/or persistence purposes.

The watercourse and associated floodplain are therefore not viewed as being of high conservational/ecological significance or value, from an aquatic biodiversity perspective. Furthermore, as the existing dirt road/farm track already has a crossing point over the watercourse and associated floodplain and the underground installation of the proposed pipeline will merely cause a temporary impact to the watercourse and associated floodplain, it is also not anticipated that the proposed development would pose any significant risk to the continued flow or ecological functionality and -integrity of the watercourse and associated floodplain.



Figure 5: Two images illustrating the presence of the significant second-order seasonal watercourse and associated floodplain, which will be traversed by the proposed access road and sewage pipeline route

Concentrated water drainage area

A small elevated hill is situated approximately 100 m south of the eastern portion of the proposed WWTW footprint area. It acts as a natural local linear surface water runoff- and drainage/watershed separator, between the areas situated north and south of the hill apex, respectively. The hill therefore creates a localised and confined watershed and catchment, from which surface water runoff and drainage is concentrated through the small south-eastern portion of the proposed WWTW footprint area, during rainfall events.

Due to the moderately sloping topography of the concentrated water drainage area along with a lack of continuous water flow through the local area, the area does not possess any locally distinct or important semi-aquatic habitat. It rather houses a relatively similar terrestrial grassland habitat relative to the surrounding landscape, with merely a slight variation in species composition and representation. The concentrated water drainage area is mainly dominated by the hydrophytic grass species *Eragrostis plana* and *Themeda triandra*, while the grass species *Eragrostis spp.* were also found to be present but to a significantly lesser extent.

No Red Data Listed-, nationally protected- or provincially protected plant species or any other plant species of conservational significance/value, were found to be present throughout the concentrated water drainage area. As stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals.

No conservationally significant or important avifaunal species/nests or other -faunal species were observed throughout the concentrated water drainage area, during the site assessment. It is also not expected that the concentrated water drainage area would specifically be utilised by any common or habitat-specific aquatic bird-, amphibian- or other aquatic faunal species as refuge or for breeding, foraging and/or persistence purposes, due to the lack of any locally distinct or important semi-aquatic habitat.

The concentrated water drainage area is therefore not viewed as being of high conservational/ecological significance or value, from an aquatic biodiversity perspective.



Figure 6: Two images illustrating the presence of the concentrated water drainage area, through which surface water runoff and drainage is concentrated through the small south-eastern portion of the proposed WWTW footprint area, during rainfall events

Seepage wetland

A small seepage wetland is present along the central-northern boundary of the proposed WWTW footprint area. A small sandstone ridge/outcrop is present directly adjacent south of the wetland, from which this wetland is continuously fed with seepage water. Two preferential water flow paths/drainage lines subsequently flow out of the wetland on the northern downstream side and discharge into the Vals River.

The wetland mainly constitutes a small natural, actively functional semi-aquatic, waterlogged habitat. The semi-aquatic habitat is mainly dominated by the sedge species *Cyperus spp.* as well as the hydrophytic grass species *Eragrostis plana* and *Themeda triandra*. A single cluster of the provincially protected succulent species *Aloe grandidentata* was also found to be present within the wetland.

No Red Data Listed-, nationally protected- or other provincially protected plant species or any other plant species of conservational significance/value, were found to be present throughout the seepage wetland. As stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals.

No conservationally significant or important avifaunal species/nests or other -faunal species were observed throughout the seepage wetland, during the site assessment. Although this is the case, the seepage wetland provides locally distinct and important semi-aquatic habitat, which could possibly be utilised by small numbers of common and habitat-specific aquatic bird-, amphibian- and other aquatic faunal species as refuge and for breeding, foraging and/or persistence purposes.

It is therefore evident from an aquatic biodiversity perspective, that the seepage wetland forms an important part of the aquatic ecology of the local area.



Figure 7: Two images illustrating the presence of the small seepage wetland is present along the central-northern boundary of the proposed WWTW footprint area

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

Seasonal watercourse

Present Ecological State (PES)

The Present Ecological State (PES) of the seasonal watercourse and associated floodplain, is classified as **Class D** as it is largely modified. A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred, mainly as a result of the highly polluted and degraded state caused by significant historical and continued raw sewage discharge into the watercourse by the township.

Ecological Importance and Sensitivity (EIS)

The Ecological Importance and Sensitivity (EIS) of the seasonal watercourse and associated floodplain, is classified as **Class D (low/marginal)** as it is not viewed as being ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications, due to the already highly polluted and degraded state. It is consequently merely viewed as being of low overall conservational significance/value.

Recommended Ecological Category (REC)

The Recommended Ecological Category (REC) of the seasonal watercourse and associated floodplain, is classified as **Class D - Maintain**.

Reasoning:

The watercourse commences within- and flows through the township and is in a highly polluted and degraded state, mainly as a result of significant historical and continued raw sewage discharge into the watercourse by the township.

Although the watercourse and associated floodplain provide locally distinct semi-aquatic habitat, which can be utilised by aquatic bird-, amphibian- and other aquatic faunal species, the area is subjected to continued anthropogenic activity and disturbance due to the close proximity of the township. It is therefore unlikely that any conservationally significant or important faunal or avifaunal species would specifically utilise the portion of the watercourse and associated floodplain associated with the proposed development, as refuge or for breeding, foraging and/or persistence purposes.

Seepage wetland

Present Ecological State (PES)

The Present Ecological State (PES) of the seepage wetland is classified as **Class A** as it is unmodified, natural and pristine.

Ecological Importance and Sensitivity (EIS)

The Ecological Importance and Sensitivity (EIS) of the seepage wetland is classified as **Class C (moderate)** as it is viewed as being ecologically important and sensitive on local scale. It is consequently viewed as being of moderate overall conservational significance/value.

Recommended Ecological Category (REC)

The Recommended Ecological Category (REC) of the seepage wetland is classified as **Class A - Maintain**.

Reasoning:

The seepage wetland provides locally distinct and important semi-aquatic habitat, which could possibly be utilised by limited common and habitat-specific aquatic bird-, amphibian- and other aquatic faunal species as refuge and for breeding, foraging and/or persistence purposes.

8.3. Terrestrial Environment

8.3.1. Current Existing Vegetation and Site Description

The proposed WWTW footprint area constitutes a moderately sloping, reasonably natural, medium-height terrestrial grassland habitat with a moderate- to high-density low-growing shrub layer. Scattered rocky outcrops/domes are present throughout the grassland landscape, which is an indication that the area is likely extensively underlain by near-surface bedrock and subsequently houses shallow soils.

The grassland habitat is mainly dominated by the grass species *Eragrostis chloromelas* and *E curvula*, while the species *Themeda triandra*, *Cymbopogon pospischilii*, *Eragrostis gummiflua*, *Agrostis lacnantha* and *Aristida spp.* were also found to be well-represented. The grass species *Digitaria eriantha*, *Elionurus muticus* and *Cynodon dactylon* were merely found to be sparsely present throughout the grassland habitat.

The low-growing shrub layer is overwhelmingly dominated by the species *Euryops subcarnosus* and the undesired indicator species of bush encroachment *Seriphium plumosum*, while the species *Asparagus sp.* and *Ziziphus zeyheriana* were merely found to be very sparsely present throughout the grassland habitat.

A diverse forb- or succulent layer was not evident throughout the grassland habitat, during the site assessment. The forb species *Hermannia depressa*, *Oxalis sp.*, *Salvia spp.*, *Dicoma anomala*, *Sonchus dregeanus*, *Pseudognaphalium luteo-album* were found to be present. A single individual of the provincially protected underground bulb species *Boophone disticha* was also found to be present within the grassland habitat. As stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals. More individual of this species could therefore potentially be present throughout the proposed WWTW footprint area.

No Red Data Listed-, nationally protected- or other provincially protected plant species or any other plant species of conservational significance/value, were found to be present throughout the grassland habitat. Again, as stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals.



Figure 8: Two images illustrating examples of the moderately sloping, reasonably natural, medium-height terrestrial grassland habitat, which is associated with the proposed WWTW footprint area

A prominent rocky ridge/outcrop with an abrupt approximate 1.5 m elevation drop, runs along the central portion of the proposed WWTW footprint area, roughly in an east to west direction. The ridge/outcrop houses a similar vegetation species composition and representation to that of the rest of the grassland habitat, but with the additional presence of the shrub species *Diospyros austro-africana* and *D lycioides* as well as the grass species *Hyparrhenia hirta* and *Melinis repens*. The fern species *Pellaea calomelanos* was also found to be very sparsely present within small rocky crevasses, associated with the ridge/outcrop. These species are diagnostically absent from the rest of the grassland habitat.

No Red Data Listed-, nationally protected- or provincially protected plant species or any other plant species of conservational significance/value, were found to be present throughout the ridge/outcrop. As stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals.

Due to the small size of the proposed WWTW footprint area relative to the local and broader surrounding undeveloped reasonably natural landscape, it is not anticipated that the proposed development would pose any significant risk to achieving and maintaining national and/or provincial conservation- and persistence targets of the area or to the continued ecological connectivity, - functionality and -integrity of the local or broader surrounding landscape.



Figure 9: Two images illustrating the presence of the prominent rocky ridge/outcrop, which runs along the central portion of the proposed WWTW footprint area, roughly in an east to west direction

8.4. Plant Species List for the Assessment Area

According to the Environmental Screening Tool Report, the Plant Species Biodiversity Theme of the assessment area is rated as being of 'low sensitivity'. The specialist is in agreement with this rating.

Table 5: Plant species list for the assessment area (Provincially protected species highlighted in yellow)

Graminoids	Forbs & Succulents	Woody Shrubs/Trees
<i>Agrostis lacnantha</i>	<i>Aloe grandidentata</i>	<i>Asparagus sp.</i>
<i>Aristida spp.</i>	<i>Boophone disticha</i>	<i>Diospyros austro-africana</i>
<i>Cymbopogon pospischilii</i>	<i>Dicoma anomala</i>	<i>Diospyros lycioides</i>
<i>Cynodon dactylon</i>	<i>Hermannia depressa</i>	<i>Euryops subcarnosus</i>
<i>Cyperus spp.</i>	<i>Oxalis sp.</i>	<i>Seriphium plumosum</i>
<i>Digitaria eriantha</i>	<i>Pellaea calomelanos</i>	<i>Ziziphus zeyheriana</i>
<i>Elionurus muticus</i>	<i>Pseudognaphalium luteo-album</i>	-
<i>Eragrostis chloromelas</i>	<i>Salvia spp.</i>	-
<i>Eragrostis curvula</i>	<i>Sonchus dregeanus</i>	-
<i>Eragrostis gummiflua</i>	-	-
<i>Eragrostis plana</i>	-	-
<i>Hyparrhenia hirta</i>	-	-
<i>Melinis repens</i>	-	-
<i>Setaria incrassata</i>	-	-
<i>Themeda triandra</i>	-	-

8.5. Fauna and Avifauna

According to the Environmental Screening Tool Report, the Animal Species Biodiversity Theme of the assessment area is rated as being of 'medium and high sensitivity' for the potential presence of the Globally Endangered Red Listed bird species *Sagittarius serpentarius* (Secretarybird) as well as the Globally Vulnerable Red Listed reptilian Species 15.

No individuals, nests or burrows of these species were however observed throughout the assessment area, during the site assessment. Although this is the case, the reasonably natural grassland landscape of the proposed WWTW footprint area provides suitable/favourable foraging habitat and prey availability for the potential/likely presence of the former species. The proposed WWTW footprint area does however not provide any suitable nesting sites for this bird species.

The latter species almost exclusively inhabits flat or sloping Highveld grasslands. This species usually lives in self-excavated burrows, although it can be opportunistic by inhabiting existing empty burrows. Although the reasonably natural grassland landscape of the proposed WWTW footprint area provides potentially suitable habitat for this species, the shallow soils underlain by near-surface bedrock result in less favourable conditions for the digging of adequate burrows. This reduces the likelihood of any significant populations of this species being present throughout the proposed WWTW footprint area.

The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). No conservationally significant or important avifaunal species/nests, other -faunal species or locally distinct avifaunal/other faunal habitats were observed throughout the assessment area, during the site assessment. Only common local resident bird species were found to be present.

Although this is the case, the seepage wetland provides locally distinct and important semi-aquatic habitat, which could possibly be utilised by small numbers of common and habitat-specific aquatic bird-, amphibian- and other aquatic faunal species as refuge and for breeding, foraging and/or persistence purposes.

Due to the increased soil surface rockiness and presence of crevasses associated with the rocky ridge/outcrop, it is also reasonably expected that the ridge/outcrop is likely utilised by small numbers of common and habitat-specific reptilian species as refuge and for breeding, foraging and/or persistence purposes.

It is however not anticipated that any conservationally significant or important faunal species would specifically utilise the assessment area as refuge or for breeding, foraging and/or persistence purposes. The mobility of faunal/avifaunal species allows for individuals to simply leave an area where disturbance is taking place and relocate to surrounding similar, adequate areas. It is consequently not anticipated that the proposed development would pose any significant risk to- or impact on the faunal or avifaunal communities throughout the local or broader surrounding landscape.

8.6. Site Ecological Importance (SEI)

The Site Ecological Importance (SEI) of the assessment area is classified as **low-medium** as it is viewed as being ecologically important and/or sensitive on local scale. Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.

The assessment area is viewed as being of low to moderate overall conservational significance/value for habitat preservation and continued ecological functionality and -integrity persistence in support of the surrounding ecosystem, broader vegetation type as well as faunal and avifaunal habitats.

Reasoning:

According to the Environmental Screening Tool Report, the Terrestrial Biodiversity Theme of the assessment area is rated as being of 'low sensitivity'. The specialist is in agreement with this rating.

The reasonably natural grassland landscape provides suitable/favourable foraging habitat and prey availability for the potential/likely presence of the Globally Endangered Red Listed bird species *Sagittarius serpentarius* (Secretarybird). The proposed WWTW footprint area does however not provide any suitable nesting sites for this bird species.

Although the reasonably natural grassland landscape provides relatively suitable habitat for the Globally Vulnerable Red Listed reptilian Species 15, the shallow soils underlain by near-surface bedrock results in less favourable conditions for the digging of adequate burrows. This reduces the likelihood of any significant populations of this species being present throughout the proposed WWTW footprint area.

The seepage wetland provides locally distinct and important semi-aquatic habitat, which could possibly be utilised by small numbers of common and habitat-specific aquatic bird-, amphibian- and other aquatic faunal species as refuge and for breeding, foraging and/or persistence purposes.

Due to the increased soil surface rockiness and presence of crevasses associated with the rocky ridge/outcrop, it is also reasonably expected that the ridge/outcrop is likely utilised by small numbers of common and habitat-specific reptilian species as refuge and for breeding, foraging and/or persistence purposes.

It is not anticipated that the proposed development would pose any significant risk to- or impact on the faunal or avifaunal communities throughout the local or broader surrounding landscape. Due to the small size of the proposed WWTW footprint area relative to the local and broader surrounding undeveloped reasonably natural landscape, it is not anticipated that the proposed development would pose any significant risk to achieving and maintaining national and/or provincial conservation- and persistence targets of the area or to the continued ecological connectivity, -functionality and -integrity of the local or broader surrounding landscape.

8.7. Main Mitigation Recommendations

8.7.1. Aquatic Environment

It is recommended that the identified seepage wetland must be adequately buffered out of the proposed development footprint area. A minimum approximately 20 m buffer distance is recommended to be implemented around the wetland. No current or future development is allowed to take place within this buffered zone.

Immediate steps must be taken by the Nketoana Local Municipality to locate and remediate the sources of the raw sewage discharge into the watercourse by the township. This must be done in order to prevent continued pollution and degradation of the watercourse and associated floodplain.

Disturbed areas within and immediately surrounding the portion of the proposed access road and pipeline which traverse the watercourse and associated floodplain, must be adequately rehabilitated concurrently with the construction processes. This must be done in order to ensure continued surface water flow through the watercourse and associated floodplain. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.

8.7.2. Terrestrial Environment

A Provincial Flora Permit has to be obtained from the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA), prior to the commencement of any construction activities and the subsequent potential removal/destruction of any identified provincially protected species individuals. It is however recommended that the single individual of the identified provincially protected species *Boophone disticha* as well as any other individuals of this species potentially found to be present during construction, must be adequately relocated to another suitable and similar area as to where they were removed from. This relocation process must be completed prior to the commencement of any vegetation clearance- and/or construction activities. A Protected Plant Species Relocation Management Plan must be compiled by a suitably qualified and experienced ecologist.

8.7.3. Fauna and Avifauna

Due to the presence of potentially suitable but less favourable habitat for the Globally Vulnerable Red Listed reptilian Species 15, it is recommended that the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) must confirm whether the presence/absence of this species must be specifically investigated by a specialist who is suitably registered with the South African Council for Natural Scientific Professions (SACNASP) in the field of practice relevant to the taxonomic group (“taxa”) of this species. This is required in accordance with the Animal Species Theme Biodiversity Protocol.

8.8. Ecological Site Sensitivity Map

The site sensitivity map below (see A3 sized map in the Appendices) illustrates the presence of the watercourse and associated floodplain, concentrated water drainage area, seepage wetland and its recommended buffer zone, prominent rocky ridge/outcrop as well as the individual and cluster of the identified provincially protected plant species.

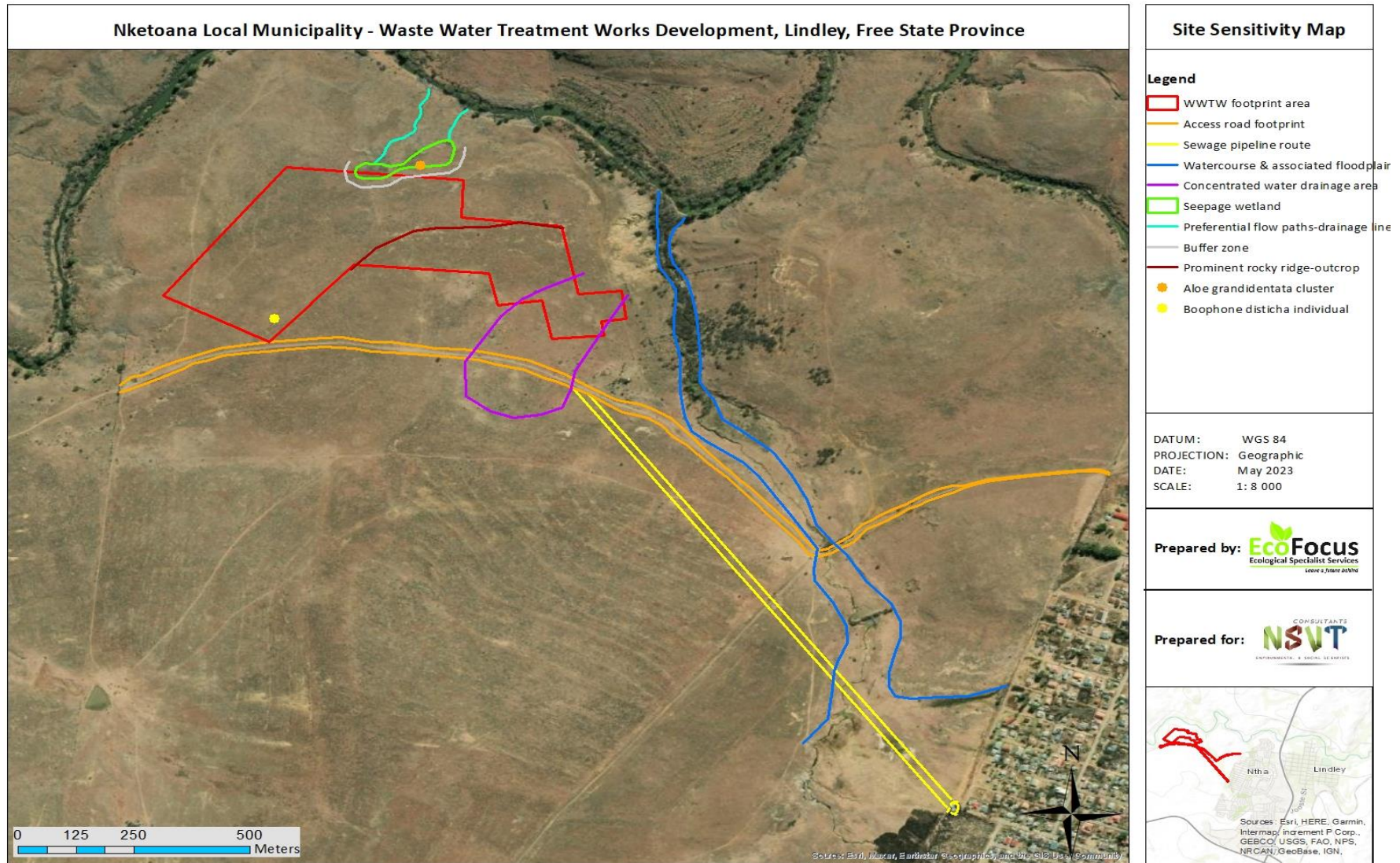


Figure 10: Site sensitivity map illustrating the presence of the watercourse and associated floodplain, concentrated water drainage area, seepage wetland and its recommended buffer zone, prominent rocky ridge/outcrop as well as the individual and cluster of the identified provincially protected plant species

9. Ecological Impact Assessment

The following section identifies the potential ecological impacts (both positive and negative), which the proposed development will have on the surrounding environment.

Once the potential ecological impacts are identified, they are assessed by rating their Environmental Risk after which the final Environmental Significance is calculated and rated for each identified ecological impact.

The same Environmental Risk rating process is then followed for each ecological impact to determine the Environmental Significance, if the recommended mitigation measures were to be implemented.

The objective of this section is therefore firstly to identify all the potential ecological impacts associated with the proposed development and secondly to determine the significance of the impacts and how effective the recommended mitigation measures will be able to reduce their significance. The potential ecological impacts which are still rated as highly significant, even after implementation of mitigations, can then be identified in order to specifically focus on implementation of effective management strategies for them.

9.1. Construction Phase

Transformation of vegetation within the assessment area associated with the Central Free State Grassland vegetation type (Gh 6)

According to SANBI (2006-2019), the entire assessment area falls within the Central Free State Grassland vegetation type (Gh 6), which mainly consists of undulating plains supporting short grassland dominated by *Themeda triandra* in natural conditions while *Eragrostis curvula* and *E chloromelas* become more dominant in degraded areas. Dwarf karoo bushes also establish in severely degraded clayey bottomlands (SANBI, 2006-2019). This vegetation type is classified as Least Concerned (SANBI, 2006-2019).

The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The mechanical clearance and excavation associated with the proposed WWTW, will in all probability completely transform the majority of the existing surface vegetation and habitat throughout the footprint area.

The entire proposed access road constitutes an existing dirt road/farm track and the proposed development of the road will therefore not result in any significant additional vegetation clearance or habitat transformation.

The entire proposed sewage pipeline route will merely constitute a narrow linear clearance and excavation section of approximately ≤ 2 m in width. The mechanical clearance and excavation associated with the proposed pipeline, will in all probability merely transform the existing surface vegetation within this narrow linear section. It is however not anticipated that the proposed pipeline development will impact significantly wider.

Extensive existing residential transformation associated with the township and town, is evident to the east of the assessment area. The local and broader landscape surrounding the assessment area however mainly constitutes undeveloped reasonably natural terrain.

The proposed WWTW footprint area constitutes a moderately sloping, reasonably natural, medium-height terrestrial grassland habitat with a moderate- to high-density low-growing shrub layer. Scattered rocky outcrops/domes are present throughout the grassland landscape, which is an indication that the area is likely extensively underlain by near-surface bedrock and subsequently houses shallow soils.

A prominent rocky ridge/outcrop with an abrupt approximate 1.5 m elevation drop, runs along the central portion of the proposed WWTW footprint area, roughly in an east to west direction. The ridge/outcrop houses a similar vegetation species composition and representation to that of the rest of the grassland habitat, but with the additional presence of a number of species which are diagnostically absent from the rest of the grassland habitat.

The significance of this potential impact will be **medium** prior to- and after implementation of recommended mitigation measures.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Destruction of-/damage to Red Data Listed, nationally- and/or provincially protected species individuals/habitats, associated with the assessment area

The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The mechanical clearance and excavation associated with the proposed WWTW, will in all probability completely transform the majority of the existing surface vegetation and habitat throughout the footprint area.

The entire proposed access road constitutes an existing dirt road/farm track and the proposed development of the road will therefore not result in any significant additional vegetation clearance or habitat transformation.

The entire proposed sewage pipeline route will merely constitute a narrow linear clearance and excavation section of approximately ≤ 2 m in width. The mechanical clearance and excavation associated with the proposed pipeline, will in all probability merely transform the existing surface vegetation within this narrow linear section. It is however not anticipated that the proposed pipeline development will impact significantly wider.

Extensive existing residential transformation associated with the township and town, is evident to the east of the assessment area. The local and broader landscape surrounding the assessment area however mainly constitutes undeveloped reasonably natural terrain.

According to the Environmental Screening Tool Report, the Plant Species Biodiversity Theme of the assessment area is rated as being of 'low sensitivity'. The specialist is in agreement with this rating.

A single cluster of the provincially protected succulent species *Aloe grandidentata* was found to be present within the seepage wetland.

A single individual of the provincially protected underground bulb species *Boophone disticha* was also found to be present within the grassland habitat of the proposed WWTW footprint area. As stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals. More individual of this species could therefore potentially be present throughout the proposed WWTW footprint area.

No Red Data Listed-, nationally protected- or other provincially protected plant species or any other plant species of conservational significance/value, were found to be present throughout the assessment area. Again, as stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals.

According to the Environmental Screening Tool Report, the Animal Species Biodiversity Theme of the assessment area is rated as being of 'medium and high sensitivity' for the potential presence of the Globally Endangered Red Listed bird species *Sagittarius serpentarius* (Secretarybird) as well as the Globally Vulnerable Red Listed reptilian Species 15.

No individuals, nests or burrows of these species were however observed throughout the assessment area, during the site assessment. Although this is the case, the reasonably natural grassland landscape of the proposed WWTW footprint area provides suitable/favourable foraging habitat and prey availability for the potential/likely presence of the former species. The proposed WWTW footprint area does however not provide any suitable nesting sites for this bird species.

The latter species almost exclusively inhabits flat or sloping Highveld grasslands. This species usually lives in self-excavated burrows, although it can be opportunistic by inhabiting existing empty burrows. Although the reasonably natural grassland landscape of the proposed WWTW footprint area provides potentially suitable habitat for this species, the shallow soils underlain by near-surface bedrock result in less favourable conditions for the digging of adequate burrows. This reduces the likelihood of any significant populations of this species being present throughout the proposed WWTW footprint area.

The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). No conservationally significant or important avifaunal species/nests, other -faunal species or locally distinct avifaunal/other faunal habitats were observed throughout the assessment area, during the site assessment. Only common local resident bird species were found to be present.

Although this is the case, the seepage wetland provides locally distinct and important semi-aquatic habitat, which could possibly be utilised by small numbers of common and habitat-specific aquatic bird-, amphibian- and other aquatic faunal species as refuge and for breeding, foraging and/or persistence purposes.

Due to the increased soil surface rockiness and presence of crevasses associated with the rocky ridge/outcrop, it is also reasonably expected that the ridge/outcrop is likely utilised by small numbers of common and habitat-specific reptilian species as refuge and for breeding, foraging and/or persistence purposes.

It is however not anticipated that any conservationally significant or important faunal species would specifically utilise the assessment area as refuge or for breeding, foraging and/or persistence purposes. The mobility of faunal/avifaunal species allows for individuals to simply leave an area where disturbance is taking place and relocate to surrounding similar, adequate areas. It is consequently not anticipated that the proposed development would pose any significant risk to- or impact on the faunal or avifaunal communities throughout the local or broader surrounding landscape.

The significance of this potential impact will be **medium** prior to implementation of recommended mitigation measures, but will be reduced to **low** by the implementation.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Terrestrial and aquatic alien invasive species establishment

No significant alien invasive species establishments were found to be present throughout the assessment area. The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The mechanical clearance and excavation associated with the proposed WWTW, will in all probability completely transform the majority of the existing surface vegetation and habitat throughout the footprint area.

The entire proposed access road constitutes an existing dirt road/farm track and the proposed development of the road will therefore not result in any significant additional vegetation clearance or habitat transformation.

The entire proposed sewage pipeline route will merely constitute a narrow linear clearance and excavation section of approximately ≤ 2 m in width. The mechanical clearance and excavation associated with the proposed pipeline, will in all probability merely transform the existing surface vegetation within this narrow linear section. It is however not anticipated that the proposed pipeline development will impact significantly wider.

The assessment area could therefore potentially be prone to slight alien invasive species establishment, due to surface disturbance and vegetation clearance caused by construction activities. The presence of the watercourse and associated floodplain as well as the seepage wetland with its two preferential water flow paths/drainage lines, could further also potentially act as significant transport/distribution vectors for numerous terrestrial and aquatic alien invasive species through the broader region.

The significance of this potential impact will be **low** prior to- and after implementation of recommended mitigation measures.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Surface material erosion

The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The mechanical clearance and excavation associated with the proposed WWTW, will in all probability completely transform the majority of the existing surface vegetation and habitat throughout the footprint area.

The entire proposed access road constitutes an existing dirt road/farm track and the proposed development of the road will therefore not result in any significant additional vegetation clearance or habitat transformation.

The entire proposed sewage pipeline route will merely constitute a narrow linear clearance and excavation section of approximately ≤ 2 m in width. The mechanical clearance and excavation associated with the proposed pipeline, will in all probability merely transform the existing surface vegetation within this narrow linear section. It is however not anticipated that the proposed pipeline development will impact significantly wider.

Due to the moderately sloping topography of the landscape, the assessment area could therefore potentially be prone to moderate surface soil erosion, due to the loosening of materials and clearance of vegetation and excavation caused by construction activities, which usually binds surface material.

The significance of this potential impact will be **low** prior to- and after implementation of recommended mitigation measures.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Dust generation and emissions

The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The mechanical clearance and excavation associated with the proposed WWTW, will in all probability completely transform the majority of the existing surface vegetation and habitat throughout the footprint area.

The entire proposed access road constitutes an existing dirt road/farm track and the proposed development of the road will therefore not result in any significant additional vegetation clearance or habitat transformation.

The entire proposed sewage pipeline route will merely constitute a narrow linear clearance and excavation section of approximately ≤ 2 m in width. The mechanical clearance and excavation associated with the proposed pipeline, will in all probability merely transform the existing surface vegetation within this narrow linear section. It is however not anticipated that the proposed pipeline development will impact significantly wider.

The construction activities associated with the proposed development, could potentially result in slight to moderate fugitive dust emissions, due to vegetation clearance and excavation as well as movement of machinery and equipment. Generated dust could potentially spread into the surrounding undeveloped landscape and contaminate the watercourse and associated floodplain as well as the seepage wetland.

The significance of this potential impact will be **low** prior to- and after implementation of recommended mitigation measures.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Impeding and contamination of the flow regimes of the watercourse and associated floodplain as well as the seepage wetland, within the associated local and broader quaternary surface water catchment- and drainage area

The assessment area falls within the Middle Vaal Water Management Area (WMA 09) and the associated C60B quaternary surface water catchment- and drainage area. It is furthermore situated in the C60B - 2562 Sub Quaternary Reach (SQR), within the Highveld Ecoregion (11). The proposed WWTW footprint area and surrounding landscape generally flows in a northerly direction, towards the Vals River (see heading 8.2.2 below).

According to the Environmental Screening Tool Report, the Aquatic Biodiversity Theme of the assessment area, is rated as being of 'low sensitivity'. The Aquatic Biodiversity Theme of the specific portion of the Vals River which flows past the proposed WWTW footprint area, is however rated as being of 'very high sensitivity'. The specialist is in agreement with these ratings.

A significant second-order seasonal watercourse and associated floodplain flows past the proposed WWTW footprint and discharges into the Vals River approximately 200 m east of the area. The proposed access road and sewage pipeline route will both traverse this watercourse and associated floodplain but at different locations. The watercourse commences within- and flows through the township and is in a highly polluted and degraded state, mainly as a result of significant historical and continued raw sewage discharge into the watercourse by the township. The smell of raw sewage is evidently present all along the length of the watercourse.

A small seepage wetland is present along the central-northern boundary of the proposed WWTW footprint area. A small sandstone ridge/outcrop is present directly adjacent south of the wetland, from which this wetland is continuously fed with seepage water. Two preferential water flow paths/drainage lines subsequently flow out of the wetland on the northern downstream side and discharge into the Vals River.

The construction activities associated with the proposed access road and pipeline developments, could potentially result in slight impeding of natural surface water flow through the watercourse and associated floodplain, within the associated local and broader quaternary surface water catchment- and drainage area, due to artificial obstruction of flow during rainfall events. The construction activities associated with the proposed WWTW footprint area could furthermore potentially result in slight impeding of natural surface water flow through the seepage wetland.

The construction phase could potentially also result in slight contamination of natural surface water flow through the watercourse and associated floodplain as well as the seepage wetland, within the associated local and broader quaternary surface water catchment- and drainage area, due to hydrocarbon and/or other chemical spills by construction machinery and equipment.

The significance of this potential impact will be **low** prior to- and after implementation of recommended mitigation measures.

Mitigation measures to reduce impacts are recommended under heading 9.4.

9.2. Operational Phase

Transformation of vegetation within the assessment area associated with the Central Free State Grassland vegetation type (Gh 6) was identified and addressed as the only significant potential long-term ecological impact, associated with the construction phase of the proposed development.

The following already discussed potential ecological impact could change in nature (duration and severity) during the operational phase. Along with the potential long-term ecological impacts as discussed under heading 9.1, the following additional potential ecological impact could also occur during the operational phase. These impacts could continue throughout the entire operational phase and lifespan of the proposed development.

Continued impeding of the flow regimes of the watercourse and associated floodplain as well as the seepage wetland, within the associated local and broader quaternary surface water catchment- and drainage area

The established WWTW, access road and pipeline could potentially continuously impede on the natural surface water flow through the through the watercourse and associated floodplain as well as the seepage wetland, within the associated local and broader quaternary surface water catchment- and drainage area, due to continued artificial obstruction of flow during rainfall events.

The significance of this potential impact will be **medium** prior to implementation of recommended mitigation measures, but will be reduced to **low** by the implementation.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Sewage contamination of the watercourse and associated floodplain, seepage wetland, Vals River as well as groundwater resources

The watercourse and associated floodplain, seepage wetland as well as ground water recourses could potentially be significantly contaminated by raw sewage, in the event of pipeline leakages, ruptures, overflows or spillages at the WWTW, during the operational phase.

Final treated effluent will continually be discharged from the established WWTW into the Vals River. If such effluents are not of sufficient quality and standards for lawful discharge, it could result in continued contamination of the Vals River.

The significance of this potential impact will be **medium** prior to implementation of recommended mitigation measures, but will be reduced to **low** by the implementation.

Mitigation measures to reduce impacts are recommended under heading 9.4.

9.3. Cumulative Impacts

The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The mechanical clearance and excavation associated with the proposed WWTW, will in all probability completely transform the majority of the existing surface vegetation and habitat throughout the footprint area.

The entire proposed access road constitutes an existing dirt road/farm track and the proposed development of the road will therefore not result in any significant additional vegetation clearance or habitat transformation.

The entire proposed sewage pipeline route will merely constitute a narrow linear clearance and excavation section of approximately ≤ 2 m in width. The mechanical clearance and excavation associated with the proposed pipeline, will in all probability merely transform the existing surface vegetation within this narrow linear section. It is however not anticipated that the proposed pipeline development will impact significantly wider.

Extensive existing residential transformation associated with the township and town, is evident to the east of the assessment area. The local and broader landscape surrounding the assessment area however mainly constitutes undeveloped reasonably natural terrain.

The watercourse and associated floodplain scored a low Ecological Importance and Sensitivity (EIS) and is merely viewed as being of low overall conservational significance/value.

The seepage wetland scored a moderate Ecological Importance and Sensitivity (EIS) and is viewed as being of moderate overall conservational significance/value.

The assessment area scored a low-medium Site Ecological Importance (SEI) value and is viewed as being of low to moderate overall conservational significance/value for habitat preservation and continued ecological functionality and -integrity persistence in support of the surrounding ecosystem, broader vegetation type as well as faunal and avifaunal habitats.

Transformation of vegetation within the assessment area associated with the Central Free State Grassland vegetation type (Gh 6) was identified and addressed as the only significant potential long-term ecological impact, associated with the construction phase of the proposed development.

Sewage contamination of the watercourse and associated floodplain, seepage wetland, Vals River as well as groundwater resources was furthermore identified and addressed as the only significant potential long-term ecological impact, associated with the operational phase of the proposed development.

The significant potential long-term ecological impacts identified for the proposed development, could potentially add low to moderate cumulative impact to the existing negative impacts caused by the extensive existing residential transformation associated with the township and town, to the east of the assessment area.

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

It is the opinion of the specialist that the proposed development of the assessment area should be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigation measures as per this ecological report 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.

9.4. Risk Ratings of Potential Ecological Impacts

The following section provides the Environmental Risk as well as the Environmental Significance Ratings for the potential ecological impacts associated with the proposed development, both before and after implementation of the recommended mitigation measures.

9.4.1. Construction Phase

Table 11: Environmental Risk and Significance Ratings

	WWTW	Access road	Sewage pipeline
Identified Environmental Impact	Transformation of vegetation within the assessment area associated with the Central Free State Grassland vegetation type (Gh 6)		
Magnitude of Negative or Positive Impact	Low (4)	-	Very low (2)
Duration of Negative or Positive Impact	Long term (4)	-	Short term (2)
Extent of Positive or Negative Impact	Local (2)	-	Local (2)
Irreplaceability of Natural Resources being impacted upon	Low (2)	-	Low (2)
Reversibility of Impact	Low (4)	-	High (2)
Probability of Impact Occurrence	High (4)	-	Low (2)
Cumulative Impact Rating prior to mitigation	Low	-	Low
Environmental Significance Score and Rating prior to mitigation	Medium (64)	-	Low (20)

<p>Mitigation Measures to be implemented</p>	<p>The proposed development footprint areas must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding undeveloped landscape may take place.</p> <p>No site construction basecamps may be established within the surrounding undeveloped landscape.</p> <p>Adequately cordon off the proposed development construction footprint areas and ensure that no construction activities, machinery or equipment operate or impact within the surrounding undeveloped landscape outside the cordoned off areas.</p> <p>Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern and restrict movement of machinery only within the proposed development construction footprint areas and to ensure environmentally responsible construction practices and activities.</p> <p>Existing roads and farm tracks in close proximity to the proposed development construction footprint areas, must be used during the excavation processes. No new temporary roads or tracks may be constructed or implemented through the surrounding undeveloped landscape.</p> <p>Disturbed areas within and immediately surrounding the proposed development construction footprint areas must be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>
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	Disturbed areas within and immediately surrounding the portion of the proposed access road and pipeline which traverse the watercourse and associated floodplain, must be adequately rehabilitated concurrently with the construction processes. This must be done in order to ensure continued surface water flow through the watercourse and associated floodplain. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.		
Cumulative Impact Rating after mitigation implementation	Low	-	Low
Environmental Significance Score and Rating after mitigation implementation	Medium (60)	-	Low (9)
	WWTW	Access road	Sewage pipeline
Identified Environmental Impact	Destruction of-/damage to Red Data Listed, nationally- and/or provincially protected species individuals/habitats, associated with the assessment area		
Magnitude of Negative or Positive Impact	Low (4)	-	Very low (2)
Duration of Negative or Positive Impact	Long term (4)	-	Short term (2)
Extent of Positive or Negative Impact	Local (2)	-	Local (2)

Irreplaceability of Natural Resources being impacted upon	Moderate (3)	-	Moderate (3)
Reversibility of Impact	Low (4)	-	High (2)
Probability of Impact Occurrence	Medium (3)	-	Low (2)
Cumulative Impact Rating prior to mitigation	Low	-	Low
Environmental Significance Score and Rating prior to mitigation	Medium (51)	-	Low (22)
Mitigation Measures to be implemented	<p>It is recommended that the identified seepage wetland must be adequately buffered out of the proposed development footprint area. A minimum approximately 20 m buffer distance is recommended to be implemented around the wetland. No current or future development is allowed to take place within this buffered zone.</p> <p>A Provincial Flora Permit has to be obtained from the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA), prior to the commencement of any construction activities and the subsequent potential removal/destruction of any identified provincially protected species individuals. It is however recommended that the single individual of the identified provincially protected species <i>Boophone disticha</i> as well as any other individuals of this species potentially found to be present during construction, must be adequately relocated to another suitable and similar area as to where they were removed from. This relocation process must be completed prior to the commencement of any vegetation clearance- and/or construction activities. A Protected Plant Species Relocation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>		

Due to the presence of potentially suitable but less favourable habitat for the Globally Vulnerable Red Listed reptilian Species 15, it is recommended that the Free State Department: Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) must confirm whether the presence/absence of this species must be specifically investigated by a specialist who is suitably registered with the South African Council for Natural Scientific Professions (SACNASP) in the field of practice relevant to the taxonomic group (“taxa”) of this species. This is required in accordance with the Animal Species Theme Biodiversity Protocol.

The proposed development footprint areas must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding undeveloped landscape may take place.

No site construction basecamps may be established within the surrounding undeveloped landscape.

Adequately cordon off the proposed development construction footprint areas and ensure that no construction activities, machinery or equipment operate or impact within the surrounding undeveloped landscape outside the cordoned off areas.

Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern and restrict movement of machinery only within the proposed development construction footprint areas and to ensure environmentally responsible construction practices and activities.

Existing roads and farm tracks in close proximity to the proposed development construction footprint areas, must be used during the excavation processes. No new temporary roads or tracks may be constructed or implemented through the surrounding undeveloped landscape.

	<p>Disturbed areas within and immediately surrounding the proposed development construction footprint areas must be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>Disturbed areas within and immediately surrounding the portion of the proposed access road and pipeline which traverse the watercourse and associated floodplain, must be adequately rehabilitated concurrently with the construction processes. This must be done in order to ensure continued surface water flow through the watercourse and associated floodplain. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>		
Cumulative Impact Rating after mitigation implementation	Low	-	
Environmental Significance Score and Rating after mitigation implementation	Low (16)	-	

	WWTW	Access road	Sewage pipeline
Identified Environmental Impact	Terrestrial and aquatic alien invasive species establishment		
Magnitude of Negative or Positive Impact	Low (4)	Very low (2)	Very low (2)
Duration of Negative or Positive Impact	Long term (4)	Long term (4)	Long term (4)
Extent of Positive or Negative Impact	Regional (3)	Local (2)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)	High (2)
Probability of Impact Occurrence	Medium (3)	Medium (3)	Medium (3)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (45)	Low (36)	Low (39)

<p style="text-align: center;">Mitigation Measures to be implemented</p>	<p>Implement an adequate Alien Invasive Species Management and Prevention Plan during the construction- and subsequent operational phases of the proposed development. Such a Management Plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>Disturbed areas within and immediately surrounding the proposed development construction footprint areas must be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>Disturbed areas within and immediately surrounding the portion of the proposed access road and pipeline which traverse the watercourse and associated floodplain, must be adequately rehabilitated concurrently with the construction processes. This must be done in order to ensure continued surface water flow through the watercourse and associated floodplain. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>		
<p>Cumulative Impact Rating after mitigation implementation</p>	Low	Low	Low
<p>Environmental Significance Score and Rating after mitigation implementation</p>	Low (11)	Low (11)	Low (11)

	WWTW	Access road	Sewage pipeline
Identified Environmental Impact	Surface material erosion		
Magnitude of Negative or Positive Impact	Low (4)	Very low (2)	Very low (2)
Duration of Negative or Positive Impact	Short term (2)	Short term (2)	Short term (2)
Extent of Positive or Negative Impact	Local (2)	Local (2)	Local (2)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)	Low (2)
Reversibility of Impact	High (2)	High (2)	High (2)
Probability of Impact Occurrence	High (4)	Medium (3)	Low (2)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (48)	Low (30)	Low (20)

<p>Mitigation Measures to be implemented</p>	<p>Implement an adequate Stormwater and Erosion Management Plan during the construction- and subsequent operational phases of the proposed development. This must be done to sufficiently manage storm water runoff and clean/dirty water separation, in order to prevent any significant soil erosion from occurring within and around the assessment area.</p> <p>Disturbed areas within and immediately surrounding the proposed development construction footprint areas must be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>Disturbed areas within and immediately surrounding the portion of the proposed access road and pipeline which traverse the watercourse and associated floodplain, must be adequately rehabilitated concurrently with the construction processes. This must be done in order to ensure continued surface water flow through the watercourse and associated floodplain. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>		
<p>Cumulative Impact Rating after mitigation implementation</p>	<p>Low</p>	<p>Low</p>	<p>Low</p>
<p>Environmental Significance Score and Rating after mitigation implementation</p>	<p>Low (18)</p>	<p>Low (9)</p>	<p>Low (9)</p>

	WWTW	Access road	Sewage pipeline
Identified Environmental Impact	Dust generation and emissions		
Magnitude of Negative or Positive Impact	Low (4)	Very low (2)	Very low (2)
Duration of Negative or Positive Impact	Short term (2)	Short term (2)	Short term (2)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Low (2)	Low (2)	Low (2)
Reversibility of Impact	Moderate (3)	Moderate (3)	Moderate (3)
Probability of Impact Occurrence	Medium (3)	Low (2)	Improbable (1)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (42)	Low (24)	Low (12)

<p style="text-align: center;">Mitigation Measures to be implemented</p>	<p>Implement suitable dust management and prevention measures during the construction phase of the proposed development.</p> <p>Construction areas and –roads to be sufficiently wetted down during the construction phase in order to prevent significant fugitive dust emissions.</p> <p>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 emissions and ensure environmentally responsible operational practices and activities.</p> <p>Disturbed areas within and immediately surrounding the proposed development construction footprint areas must be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>Disturbed areas within and immediately surrounding the portion of the proposed access road and pipeline which traverse the watercourse and associated floodplain, must be adequately rehabilitated concurrently with the construction processes. This must be done in order to ensure continued surface water flow through the watercourse and associated floodplain. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>		
<p>Cumulative Impact Rating after mitigation implementation</p>	Low	Low	Low
<p>Environmental Significance Score and Rating after mitigation implementation</p>	Low (22)	Low (11)	Low (11)

	WWTW	Access road	Sewage pipeline
Identified Environmental Impact	Impeding and contamination of the flow regimes of the watercourse and associated floodplain as well as the seepage wetland, within the associated local and broader quaternary surface water catchment- and drainage area		
Magnitude of Negative or Positive Impact	Low (4)	Very low (2)	Very low (2)
Duration of Negative or Positive Impact	Short term (2)	Short term (2)	Short term (2)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Low (2)	Low (2)
Reversibility of Impact	Low (4)	Low (4)	Low (4)
Probability of Impact Occurrence	Medium (3)	Low (2)	Low (2)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Low (48)	Low (26)	Low (26)

<p>Mitigation Measures to be implemented</p>	<p>It is recommended that the identified seepage wetland must be adequately buffered out of the proposed development footprint area. A minimum approximately 20 m buffer distance is recommended to be implemented around the wetland. No current or future development is allowed to take place within this buffered zone.</p> <p>An adequately sized culvert must be implemented at the proposed access road crossing in order to ensure continued surface water flow through the watercourse and associated floodplain.</p> <p>Implement an adequate Stormwater and Erosion Management Plan during the construction- and subsequent operational phases of the proposed development. This must be done to sufficiently manage storm water runoff and clean/dirty water separation, in order to attempt to maintain the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.</p> <p>A Water Use License Application (WULA) must furthermore be submitted to the Department of Water and Sanitation (DWS), to request authorisation for the proposed development through the watercourse and associated floodplain at the proposed access road and pipeline route crossings, in accordance with the National Water Act (Act 36 of 1998).</p> <p>Disturbed areas within and immediately surrounding the portion of the proposed access road and pipeline which traverse the watercourse and associated floodplain, must be adequately rehabilitated concurrently with the construction processes. This must be done in order to ensure continued surface water flow through the watercourse and associated floodplain. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>
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	<p>Immediate steps must be taken by the Nketoana Local Municipality to locate and remediate the sources of the raw sewage discharge into the watercourse by the township. This must be done in order to prevent continued pollution and degradation of the watercourse and associated floodplain.</p> <p>If 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/feasibly possible from the watercourse and associated floodplain as well as the seepage wetland.</p> <p>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.</p> <p>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 phase.</p> <p>Spill kits must be readily available at the construction site. All relevant employees must be adequately trained on the correct procedure and use of the spill kits.</p>		
Cumulative Impact Rating after mitigation implementation	Low	Low	Low
Environmental Significance Score and Rating after mitigation implementation	Low (12)	Low (11)	Low (11)

9.4.2. Operational Phase

Table 12: Environmental Risk and Significance Ratings

	WWTW	Access road	Sewage pipeline
Identified Environmental Impact	Continued impeding of the flow regimes of the watercourse and associated floodplain as well as the seepage wetland, within the associated local and broader quaternary surface water catchment- and drainage area		
Magnitude of Negative or Positive Impact	Low (4)	Very low (2)	Very low (2)
Duration of Negative or Positive Impact	Medium term (3)	Medium term (3)	Medium term (3)
Extent of Positive or Negative Impact	Regional (3)	Regional (3)	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	Low (2)	Low (2)
Reversibility of Impact	Low (4)	Low (4)	Low (4)
Probability of Impact Occurrence	Medium (3)	Low (2)	Low (2)
Cumulative Impact Rating prior to mitigation	Low	Low	Low
Environmental Significance Score and Rating prior to mitigation	Medium (51)	Low (28)	Low (28)

<p>Mitigation Measures to be implemented</p>	<p>If all the recommended mitigation measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued impeding or significant impact on the watercourse and associated floodplain as well as the seepage wetland, within the associated local and broader quaternary surface water catchment- and drainage area.</p> <p>Implement an adequate Stormwater and Erosion Management Plan during the construction- and subsequent operational phases of the proposed development. This must be done to sufficiently manage storm water runoff and clean/dirty water separation, in order to attempt to maintain the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.</p>		
<p>Cumulative Impact Rating after mitigation implementation</p>	<p>Low</p>	<p>Low</p>	<p>Low</p>
<p>Environmental Significance Score and Rating after mitigation implementation</p>	<p>Low (13)</p>	<p>Low (12)</p>	<p>Low (12)</p>
	<p>WWTW</p>	<p>Access road</p>	<p>Sewage pipeline</p>
<p>Identified Environmental Impact</p>	<p>Sewage contamination of the watercourse and associated floodplain, seepage wetland, Vals River as well as groundwater resources</p>		
<p>Magnitude of Negative or Positive Impact</p>	<p>High (8)</p>	<p>-</p>	<p>Medium (6)</p>
<p>Duration of Negative or Positive Impact</p>	<p>Medium term (3)</p>	<p>-</p>	<p>Medium term (3)</p>

Extent of Positive or Negative Impact	Regional (3)	-	Regional (3)
Irreplaceability of Natural Resources being impacted upon	Moderate (3)	-	Moderate (3)
Reversibility of Impact	Low (4)	-	Moderate (3)
Probability of Impact Occurrence	Medium (3)	-	Medium (3)
Cumulative Impact Rating prior to mitigation	Medium	-	Medium
Environmental Significance Score and Rating prior to mitigation	Medium (63)	-	Medium (54)
Mitigation Measures to be implemented	<p>It is presumed and reasonably expected that the design specifications and size parameters of the proposed sewage ponds will ensure adequate containment and subsequent evaporation of the required maximum potential volumes of generated final effluent, even during significant rainfall events. Under no circumstances may intentional discharges or unintentional overflows or spillages of untreated effluent from the sewage ponds or WWTW take place as this could potentially lead to contamination of the seepage wetland and Vals River.</p> <p>The proposed sewage ponds must be sufficiently lined, in accordance with the relevant minimum norms and standards, in order to prevent undesired seepages or leakages into the groundwater resources.</p> <p>The integrity of the lining must be inspected on a minimum annual basis in order to ensure its continued functionality and prevent leakages.</p>		

Adequate leakage detection and prevention systems must be installed for the WWTW in order to detect any potential leakages and subsequent contamination of groundwater resources.

The integrity of the established pipeline must be inspected on a minimum weekly basis in order to ensure its continued functionality and prevent leakages or ruptures.

Adequate leakage detection and prevention systems must be installed for the pipeline in order to detect any potential leakages and subsequent contamination of the watercourse and associated floodplain.

Adequate sewage spillage clean-up procedures must be developed and all relevant employees must be sufficiently trained on- and apply these procedures during the operational phase.

Spill kits must be readily available at the established WWTW. All relevant employees must be adequately trained on the correct procedure and use of the spill kits.

If any leakages or overflows of the WWTW or pipeline occur, the competent authority must immediately be notified and the necessary steps must be followed by the applicant to locate and remediate the source of contamination, as soon as practicably possible/feasible.

Final treated effluent to be discharged must be chemically and biologically tested by an accredited laboratory on a minimum weekly basis. This must be done to ensure that such effluents are of sufficient quality and standards for lawful discharge.

	The established WWTW must at all times ensure lawful conduct and operations, in accordance with the relevant legislation.		
Cumulative Impact Rating after mitigation implementation	Low	-	Low
Environmental Significance Score and Rating after mitigation implementation	Low (32)	-	Low (30)

10. Summary and Conclusion

Proposed Development Area Clearance

The proposed development will consist of the following (assessment area):

- WWTW approximately 18.2 ha
- Access road approximately 2.1 km
- Sewage pipeline from the township approximately 1.2 km

The mechanical clearance and excavation associated with the proposed WWTW, will in all probability completely transform the majority of the existing surface vegetation and habitat throughout the footprint area.

The entire proposed access road constitutes an existing dirt road/farm track and the proposed development of the road will therefore not result in any significant additional vegetation clearance or habitat transformation.

The entire proposed sewage pipeline route will merely constitute a narrow linear clearance and excavation section of approximately ≤ 2 m in width. The mechanical clearance and excavation associated with the proposed pipeline, will in all probability merely transform the existing surface vegetation within this narrow linear section. It is however not anticipated that the proposed pipeline development will impact significantly wider.

Extensive existing residential transformation associated with the township and town, is evident to the east of the assessment area. The local and broader landscape surrounding the assessment area however mainly constitutes undeveloped reasonably natural terrain.

Vegetation Type and Conservation Status

According to SANBI (2006-2019), the entire assessment area falls within the Central Free State Grassland vegetation type (Gh 6), which mainly consists of undulating plains supporting short grassland dominated by *Themeda triandra* in natural conditions while *Eragrostis curvula* and *E chloromelas* become more dominant in degraded areas. Dwarf karoo bushes also establish in severely degraded clayey bottomlands (SANBI, 2006-2019). This vegetation type is classified as Least Concerned (SANBI, 2006-2019).

Virtually the entire assessment area and broader surrounding landscape is categorised as Other Natural Area (ONA), according to the Free State Provincial Spatial Biodiversity Plan (Collins, 2018), which sets out biodiversity priority areas in the province.

A limited portion of the proposed sewage pipeline route however traverses Degraded land, according to the Free State Provincial Spatial Biodiversity Plan (Collins, 2018). This area constitutes an historically cultivated agricultural cropland.

According to the Environmental Screening Tool Report, the Terrestrial Biodiversity Theme of the assessment area is rated as being of 'low sensitivity'. The specialist is in agreement with this rating.

Aquatic Environment

Water Catchment and Drainage

The assessment area falls within the Middle Vaal Water Management Area (WMA 09) and the associated C60B quaternary surface water catchment- and drainage area. It is furthermore situated in the C60B - 2562 Sub Quaternary Reach (SQR), within the Highveld Ecoregion (11). The proposed WWTW footprint area and surrounding landscape generally flows in a northerly direction, towards the Vals River (see discussion below).

Watercourse Baseline Information

The Vals River flows past the proposed WWTW footprint area approximately 170 m to the north and continues in a westerly direction. It is evident from a hydrological perspective, that the Vals River forms an important part of the local and broader quaternary surface water catchment- and drainage area, towards the west.

According to the National Freshwater Ecosystem Priority Areas Database (NFEPAs, 2011), the portion of the C60B - 2562 Sub Quaternary Reach (SQR) associated with the assessment 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 specific portion of the Vals River which flows past the proposed WWTW footprint area or the local downstream region or are expected to specifically utilise this portion of the river as refuge or for breeding, foraging and/or persistence purposes.

According to the Environmental Screening Tool Report, the Aquatic Biodiversity Theme of the assessment area, is rated as being of 'low sensitivity'. The Aquatic Biodiversity Theme of the specific portion of the Vals River which flows past the proposed WWTW footprint area, is however rated as being of 'very high sensitivity'. The specialist is in agreement with these ratings.

It is however not anticipated that the proposed development would pose any significant risk to the continued flow or ecological functionality and -integrity of the specific portion of the Vals River or the associated local and broader quaternary surface water catchment- and drainage area.

Watercourses and Wetlands

A significant second-order seasonal watercourse and associated floodplain flows past the proposed WWTW footprint and discharges into the Vals River approximately 200 m east of the area. The proposed access road and sewage pipeline route will both traverse this watercourse and associated floodplain but at different locations. The watercourse commences within- and flows through the township and is in a highly polluted and degraded state, mainly as a result of significant historical and continued raw sewage discharge into the watercourse by the township. The smell of raw sewage is evidently present all along the length of the watercourse.

The watercourse and associated floodplain mainly constitute a broad disturbed but actively functional semi-aquatic habitat. The watercourse and associated floodplain are not viewed as being of high conservational/ecological significance or value, from an aquatic biodiversity perspective. Furthermore, as the existing dirt road/farm track already has a crossing point over the watercourse and associated floodplain and the underground installation of the proposed pipeline will merely cause a temporary impact to the watercourse and associated floodplain, it is also not anticipated that the proposed development would pose any significant risk to the continued flow or ecological functionality and -integrity of the watercourse and associated floodplain.

A small elevated hill is situated approximately 100 m south of the eastern portion of the proposed WWTW footprint area. It acts as a natural local linear surface water runoff- and drainage/watershed separator, between the areas situated north and south of the hill apex, respectively. The hill therefore creates a localised and confined watershed and catchment, from which surface water runoff and drainage is concentrated through the small south-eastern portion of the proposed WWTW footprint area, during rainfall events.

Due to the moderately sloping topography of the concentrated water drainage area along with a lack of continuous water flow through the local area, the area does not possess any locally distinct or important semi-aquatic habitat. It rather houses a relatively similar terrestrial grassland habitat relative to the surrounding landscape, with merely a slight variation in species composition and representation. The concentrated water drainage area is not viewed as being of high conservational/ecological significance or value, from an aquatic biodiversity perspective.

A small seepage wetland is present along the central-northern boundary of the proposed WWTW footprint area. A small sandstone ridge/outcrop is present directly adjacent south of the wetland, from which this wetland is continuously fed with seepage water. Two preferential water flow paths/drainage lines subsequently flow out of the wetland on the northern downstream side and discharge into the Vals River.

The wetland mainly constitutes a small natural, actively functional semi-aquatic, waterlogged habitat. A single cluster of the provincially protected succulent species *Aloe grandidentata* was found to be present within the seepage wetland. It is evident from an aquatic biodiversity perspective, that the seepage wetland forms an important part of the aquatic ecology of the local area.

Terrestrial Environment

The proposed WWTW footprint area constitutes a moderately sloping, reasonably natural, medium-height terrestrial grassland habitat with a moderate- to high-density low-growing shrub layer. Scattered rocky outcrops/domes are present throughout the grassland landscape, which is an indication that the area is likely extensively underlain by near-surface bedrock and subsequently houses shallow soils. A single individual of the provincially protected underground bulb species *Boophone disticha* was also found to be present within the grassland habitat of the proposed WWTW footprint area. As stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals. More individual of this species could therefore potentially be present throughout the proposed WWTW footprint area.

A prominent rocky ridge/outcrop with an abrupt approximate 1.5 m elevation drop, runs along the central portion of the proposed WWTW footprint area, roughly in an east to west direction. The ridge/outcrop houses a similar vegetation species composition and representation to that of the rest of the grassland habitat, but with the additional presence of a number of species which are diagnostically absent from the rest of the grassland habitat.

No Red Data Listed-, nationally protected- or other provincially protected plant species or any other plant species of conservational significance/value, were found to be present throughout the assessment area. Again, as stated under heading 2, it must however be noted that the seasonal timing of the assessment was not necessarily favourable for successful identification of all plant species individuals.

According to the Environmental Screening Tool Report, the Plant Species Biodiversity Theme of the assessment area is rated as being of 'low sensitivity'. The specialist is in agreement with this rating.

Due to the small size of the proposed WWTW footprint area relative to the local and broader surrounding undeveloped reasonably natural landscape, it is not anticipated that the proposed development would pose any significant risk to achieving and maintaining national and/or provincial conservation- and persistence targets of the area or to the continued ecological connectivity, - functionality and -integrity of the local or broader surrounding landscape.

Fauna and Flora

According to the Environmental Screening Tool Report, the Animal Species Biodiversity Theme of the assessment area is rated as being of 'medium and high sensitivity' for the potential presence of the Globally Endangered Red Listed bird species *Sagittarius serpentarius* (Secretarybird) as well as the Globally Vulnerable Red Listed reptilian Species 15.

No individuals, nests or burrows of these species were however observed throughout the assessment area, during the site assessment. Although this is the case, the reasonably natural grassland landscape of the proposed WWTW footprint area provides suitable/favourable foraging habitat and prey availability for the potential/likely presence of the former species. The proposed WWTW footprint area does however not provide any suitable nesting sites for this bird species.

The latter species almost exclusively inhabits flat or sloping Highveld grasslands. This species usually lives in self-excavated burrows, although it can be opportunistic by inhabiting existing empty burrows. Although the reasonably natural grassland landscape of the proposed WWTW footprint area provides potentially suitable habitat for this species, the shallow soils underlain by near-surface bedrock result in less favourable conditions for the digging of adequate burrows. This reduces the likelihood of any significant populations of this species being present throughout the proposed WWTW footprint area.

The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). No conservationally significant or important avifaunal species/nests, other -faunal species or locally distinct avifaunal/other faunal habitats were observed throughout the assessment area, during the site assessment. Only common local resident bird species were found to be present.

Although this is the case, the seepage wetland provides locally distinct and important semi-aquatic habitat, which could possibly be utilised by small numbers of common and habitat-specific aquatic bird-, amphibian- and other aquatic faunal species as refuge and for breeding, foraging and/or persistence purposes.

Due to the increased soil surface rockiness and presence of crevasses associated with the rocky ridge/outcrop, it is also reasonably expected that the ridge/outcrop is likely utilised by small numbers of common and habitat-specific reptilian species as refuge and for breeding, foraging and/or persistence purposes.

It is however not anticipated that any conservationally significant or important faunal species would specifically utilise the assessment area as refuge or for breeding, foraging and/or persistence purposes. The mobility of faunal/avifaunal species allows for individuals to simply leave an area where disturbance is taking place and relocate to surrounding similar, adequate areas. It is consequently not anticipated that the proposed development would pose any significant risk to- or impact on the faunal or avifaunal communities throughout the local or broader surrounding landscape.

Conclusion

The watercourse and associated floodplain scored a low Ecological Importance and Sensitivity (EIS) and is merely viewed as being of low overall conservational significance/value.

The seepage wetland scored a moderate Ecological Importance and Sensitivity (EIS) and is viewed as being of moderate overall conservational significance/value.

The assessment area scored a low-medium Site Ecological Importance (SEI) value and is viewed as being of low to moderate overall conservational significance/value for habitat preservation and continued ecological functionality and -integrity persistence in support of the surrounding ecosystem, broader vegetation type as well as faunal and avifaunal habitats.

Transformation of vegetation within the assessment area associated with the Central Free State Grassland vegetation type (Gh 6) was identified and addressed as the only significant potential long-term ecological impact, associated with the construction phase of the proposed development.

Sewage contamination of the watercourse and associated floodplain, seepage wetland, Vals River as well as groundwater resources was furthermore identified and addressed as the only significant potential long-term ecological impact, associated with the operational phase of the proposed development.

The significant potential long-term ecological impacts identified for the proposed development, could potentially add low to moderate cumulative impact to the existing negative impacts caused by the extensive existing residential transformation associated with the township and town, to the east of the assessment area.

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

It is the opinion of the specialist that the proposed development of the assessment area should be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigation measures as per this ecological report 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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Abbreviated Curriculum Vitae

Qualifications

- M.Env.Sci Ecological Remediation and Sustainable Utilisation/Vegetation Ecology
 - 2010 - North West University Potchefstroom
- B.Sc Botany and Zoology (Cum Laude)
 - 2008 - 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

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 Background

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.

He was subsequently employed by **Fraser Alexander Tailings from October 2011 to the end of November 2015 as an Environmental Contracts Manager**, where he was responsible for the technical and operational management of all Fraser Alexander Tailings' mining environmental rehabilitation work. He was responsible for all facets of project management, as well as implementation of rehabilitation and environmental strategies, by planning activities, organising physical, financial and human resources, delegating task responsibilities, leading people, controlling risks and providing technical support.

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.

He was then employed by **Enviroworks Consulting from January 2016 to the end of May 2017 as a Senior Ecological Specialist** where he was responsible for virtually all Ecological, Aquatic and Wetland 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).

Rikus then subsequently established the company EcoFocus Consulting (Pty) Ltd at the end of May 2017, which provides high quality professional environmental and ecological specialist services and solutions to the industrial development-, construction-, mining-, agricultural and other sectors.

He possesses significant qualifications, vast knowledge, skills and practical experience in the specialist field of ecological and environmental management. This, coupled with his disciplined, determined and goal-driven approach, as well as 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

2023

- Proposed 1 500 m² Setsoto Local Municipality Water Treatment Works Expansion and Sludge Dam Development, Clocolan, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 1 500 m² Setsoto Local Municipality Water Treatment Works Expansion and Sludge Dam Development, Clocolan, Free State Province.
- Aquatic Ecological Assessment for the proposed 9.6 km Camel Thorn Solar 132 kV Transmission Line Development, Prieska, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 9.6 km Camel Thorn Solar 132 kV Transmission Line Development, Prieska, Northern Cape Province.
- Proposed 24.2 ha Virginia-Kroonstad Six (6) Borrow Pit Developments, Free State Province.
- Proposed 10.75 ha Kroonstad-Steynsrus NEMA Section 24G Two (2) Borrow Pit Developments, Free State Province.
- Ecological Compliance Statement for the proposed 11.1 ha Jacksonville Residential Development, Kimberley, Northern Cape Province.
- Proposed 52.8 km Bethlehem-Fouriesburg Pipeline Development, Free State Province.
- Ecological Rehabilitation and Alien Invasive Species Management Plan for the Konsantas Sand dam-wall decommissioning and removal, Kestell, Free State Province.

- Proposed 6.32 ha Syngenta Stilgewaght Dam Development, Bethlehem, Free State Province.
- Aquatic Ecological Assessment for the proposed 14 km Khauta Solar Photovoltaic Cluster 132 kV Everest Transmission Line Development, Riebeeckstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 14 km Khauta Solar Photovoltaic Cluster 132 kV Everest Transmission Line Development, Riebeeckstad, Free State Province.
- Aquatic Ecological Assessment for the proposed 13 km Khauta Solar Photovoltaic Cluster 132 kV Leander Transmission Line Development, Riebeeckstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 13 km Khauta Solar Photovoltaic Cluster 132 kV Leander Transmission Line Development, Riebeeckstad, Free State Province.
- Proposed Tweefontein Gauging Weir Development, Bothaville, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed Tweefontein Gauging Weir Development, Bothaville, Free State Province.
- Grazing and Invasive Species Assessment for the Farm Petronella No. 579 outside Reitz, Free State Province.
- Proposed 16.1 ha Itau Milling Storage Area Development, Bloemfontein, Free State Province.
- Proposed 3.84 ha Itau Milling NEMA Section 24G Plot 40 Commercial Development project in Bloemfontein, Free State Province.
- Proposed 18.73 ha Nketoana Local Municipality Geluk Dam Development, Reitz, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 18.73 ha Nketoana Local Municipality Geluk Dam Development, Reitz, Free State Province.
- Desktop Ecological Compliance Statement for the proposed 8.69 ha Morgen Residential Development, Reitz, Free State Province.
- Proposed 5 707 ha Farm Mooimeisjesfontein No. 118 Prospecting Right, near Mahikeng, North West Province.
- Ecological Compliance Statement for the proposed 0.99 ha Rika Hannekom Hospitality Facility Development, Keimoes, Northern Cape Province.
- Ecological Exemption Letter for the Wilge Waste Water Treatment Works Upgrading, Harrismith, Free State Province.

2022

- Aquatic Ecological Assessment for the proposed 178 ha A1 Groblershoop 50 MW PV Solar Plant Development, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 178 ha A1 Groblershoop 50 MW PV Solar Plant Development, Northern Cape Province.
- Proposed 14.3 ha North West Department of Education Ga-Maloka Primary School Expansion project in Ga-Maloka, North West Province.
- Aquatic Ecological Site Verification Report for the proposed 661 ha Khauta Solar PV Cluster Development, Riebeeckstad, Free State Province.
- Grazing and Invasive Species Assessment for the Farm Fourina No. 362 outside Fouriesburg, Free State Province.
- Desktop ecological assessment for the proposed 2.7 ha Muller Composting Abattoir and Composting Facility Development near Frankfort, Free State Province.
- Proposed 5.22 ha Equity Properties Midway Guesthouse Development in Bloemfontein, Free State Province.
- Proposed 1.5 ha Reeco Holdings (Pty) Ltd 15 Eco-villa Units Development near Ritchie, Northern Cape Province.
- Proposed 63.4 ha Kareeberg Local Municipality Carnarvon Residential Development, Northern Cape Province.
- Legal comments and responses for the Grazing and Invasive Species Assessment for the Farms Liebenbergsvlei No. 148 & Aasvogelkrans No. 96, outside Bethlehem, Free State Province.
- Legal comments and responses for the Grazing and Invasive Species Assessment for the Farm Erfenis No. 1014, outside Bethlehem, Free State Province.
- Proposed 16.8 ha Mafube Local Municipality Strasburg Mixed Land Use Development, Frankfort, Free State Province.
- Revision of the Basic Assessment process for a poultry broiler facility on the Farm Dwarsfontein 1 IQ, near Derby, North West Province.
- Aquatic Ecological Assessment for the proposed 101 ha 80 MW Khauta West Solar PV Facility Development, Riebeeckstad, Free State Province.
- Aquatic Ecological Assessment for the proposed 87 ha 50 MW Khauta e Nyane Solar PV Facility Development, Riebeeckstad, Free State Province.
- Aquatic Ecological Assessment for the proposed 168 ha 110 MW Khauta South Solar PV Facility Development, Riebeeckstad, Free State Province.

- Aquatic Ecological Assessment for the proposed 273 ha 165 MW Khauta North Solar PV Facility Development, Riebeeckstad, Free State Province.
- Proposed 224.4 MW Prieska Power Reserve Wind Power Facility Development outside Prieska, Northern Cape Province.
- Proposed 17.4 ha Dikgatlong Local Municipality Residential Development, Delportshoop, Northern Cape Province.
- Proposed 7.91 ha Dikgatlong Local Municipality Residential Development, Delportshoop, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 101 ha 80 MW Khauta West Solar PV Facility Development, Riebeeckstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 87 ha 50 MW Khauta e Nyane Solar PV Facility Development, Riebeeckstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 168 ha 110 MW Khauta South Solar PV Facility Development, Riebeeckstad, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 273 ha 165 MW Khauta North Solar PV Facility Development, Riebeeckstad, Free State Province.
- Aquatic Ecological Assessment for the proposed 3000 m² Olympic Flame Filling Station Development, Welkom, Free State Province.
- Proposed 45.6 ha Farm Reliance No. 347 Agricultural Development, Griekwastad, Northern Cape Province.
- Aquatic Ecological Assessment for the proposed 3.9 km Groblershoop 132 kV Transmission Line Development, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 3.9 km Groblershoop 132 kV Transmission Line Development, Northern Cape Province.
- Proposed 18.6 ha BFW Precast Concrete Towers Manufacturing Facility Development, Beaufort West, Western Cape Province.
- Proposed 4.5 ha Botshabelo Leisure Resort Development, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 4.5 ha Botshabelo Leisure Resort Development, Free State Province.
- Grazing and Invasive Species Assessment for the Farm Klafervley No. 133 outside Volksrust, Mpumalanga Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 18.6 ha BFW Precast Concrete Towers Manufacturing Facility Development, Beaufort West, Western Cape Province.

- Ecological Rehabilitation and Alien Invasive Species Management Plan for a proposed 4.5 ha Botshabelo Leisure Resort Development, Free State Province.
- Protected Plant Species Management Plan for a proposed 4.5 ha Botshabelo Leisure Resort Development, Free State Province.
- Appeal submission against the Environmental Authorisation for a poultry broiler facility on the Farm Dwarsfontein 1 IQ, near Derby, North West Province.
- Proposed 4.18 ha Itau Milling NEMA Section 24G Plot 39 Commercial Development project in Bloemfontein, Free State Province.

2021

- Proposed 126.77 ha Orania Residential development project in Orania, Northern Cape Province.
- Grazing and Invasive Species Follow-up Assessment for the Farm Tweefontein no 3344, outside Newcastle, KwaZulu-Natal Province.
- Proposed 245.5 ha Kgatelopele Local Municipality Residential development project in Danielskuil, Northern Cape Province.
- Relocation of provincially protected plant species individuals for the proposed 30 ha Portion 30 of the Farm Lilyvale no 2313 Residential development project in Bloemfontein, Free State Province.
- Proposed 0.5 ha Mduwelanga Projects Agricultural development project outside Paul Roux, Free State Province.
- Proposed Moledi Gorge Watercourse Weir NEMA Section 24G development outside Derby, North West Province.
- Revision of a proposed 135 ha Farm Zulani no 167 agricultural development project outside Douglas, Northern Cape Province.
- Grazing and Invasive Species Assessment for the Farm Kuilenburg no 241, outside Reitz, Free State Province.
- Revision of the Biodiversity Offset Feasibility Report for a proposed 385 ha Idstone Farming agricultural development projects outside Douglas, Northern Cape Province.
- Erosion and Invasive Species Assessment for the Farms Nebo A no 957, Tevrede no 1088, Sarona no 1089 & Uitkyk no 1119, outside Reitz, Free State Province.
- Proposed 267.2 ha Tswaing Local Municipality residential development project in Ottosdal, North West Province.

- Proposed 10.2 ha PepsiCo Inc residential development project in Marchand, Northern Cape Province.
- Proposed 182 ha Farm Selosesha no 900 mixed land use development project in Thaba Nchu, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 182 ha Farm Selosesha no 900 mixed land use development project in Thaba Nchu, Free State Province.
- Proposed 3.5 ha Itau Milling NEMA Section 24G Solar Power Development project in Bloemfontein, Free State Province.
- Grazing and Invasive Species Assessment for the Farm Brakfontein no 244, outside Verkykerskop, Free State Province.
- Wetland/watercourse Assessment for the proposed 250 ha Subsolar Energy Serurubele Solar Development project near Bloemfontein, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 250 ha Subsolar Energy Serurubele Solar Development project near Bloemfontein, Free State Province.
- Wetland/watercourse Assessment for the proposed 171 ha Subsolar Energy Sonneblom Solar Development project near Bloemfontein, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 171 ha Subsolar Energy Sonneblom Solar Development project near Bloemfontein, Free State Province.
- Proposed 13.6 ha Haldon Estate development project in Bloemfontein, Free State Province.
- Wetland/watercourse Assessment for the proposed 200 ha Subsolar Energy Delta Solar Development project near Bloemhof, North West Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 200 ha Subsolar Energy Delta Solar Development project near Bloemhof, North West Province.
- Water Use License Application (WULA) Specialist Opinion and Recommendation Letter for the proposed three Subsolar Energy Solar Development projects.
- Grazing and Invasive Species Follow-up Assessment for the Farm Waterval West no 653, outside Steynsrus, Free State Province.
- Proposed 25 ha Letsemeng Local Municipality landfill site development project in Luckhof, Free State Province.
- *Vachellia erioloba* Counting Report for the proposed 286 ha Subsolar Energy Gamma Solar Development project near Vryburg, North West Province.
- *Vachellia erioloba* Counting Report for the proposed 243 ha Subsolar Energy Khubu Solar Development project near Vryburg, North West Province.

- *Vachellia erioloba* Counting Report for the proposed 224 ha Subsolar Energy Protea Solar Development project near Vryburg, North West Province.
- *Vachellia erioloba* Counting Report for the proposed 262 ha Subsolar Energy Impala Solar Development project near Vryburg, North West Province.
- *Vachellia erioloba* Counting Report for the proposed 265 ha Subsolar Energy Sonbesie Solar Development project near Vryburg, North West Province.
- Ecological site suitability assessments for three potential 583 ha, 300 ha and 227 ha Alt-e Developments Herbert Phase 2 Solar Power Facility development projects near Douglas, Northern Cape Province.
- Proposed 113 ha Danrika Boerdery Edms BPK Vineyard Development project near Prieska, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- Ecological Rehabilitation and Alien Invasive Species Management Plan for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- Protected Plant Species Management Plan for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- Ecological Stormwater and Erosion Management Plan for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- GIS Master Layout Plan for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- Grazing and Invasive Species Follow-up Assessment for the Farm Klipfontein No 71 outside Lindley, Free State Province.
- Proposed 384.3 ha Prieska Power Reserve Solar Power Facility Development outside Prieska, Northern Cape Province.
- Aquatic Ecological Assessment for the proposed Farm Bullhoek Chicken Layer Houses and Evaporation Ponds Expansion near Swartruggens, North West Province.
- Water Use License Application (WULA) Risk Assessment for the proposed Farm Bullhoek Chicken Layer Houses and Evaporation Ponds Expansion near Swartruggens, North West Province.

- Grazing and Invasive Species Assessment for the Farm Kleine Fontein No 1160 outside Bergville, KwaZulu-Natal Province.
- Proposed 1.37 km Mantsopa Local Municipality Water Pipeline Development in Ladybrand, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 1.37 km Mantsopa Local Municipality Water Pipeline Development in Ladybrand, Free State Province.
- Grazing and Invasive Species Assessment for the Farm Elizabeth No 220 outside Bethlehem, Free State Province.
- Grazing and Invasive Species Follow-up Assessment for the Farm Retiefs Nek No 123 outside Bethlehem, Free State Province.
- Grazing and Invasive Species Follow-up Assessment for the Farm Brakfontein No 244, outside Verkykerskop, Free State Province.
- Proposed 107.8 ha Danrika Boerdery Edms BPK NEMA Section 24G Development project near Prieska, Northern Cape Province.