

**WETLAND DELINEATION AND IMPACT
ASSESSMENT REPORT AT
SKHWAHLANE**

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Prepared for

Nkanivo Development Consultants

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Project Name:

**WETLAND DELINEATION AND IMPACT ASSESSMENT REPORT FOR THE
PROPOSED RESIDENTIAL AREA AT SKHWAHLANE TOWNSHIP
DEVELOPMENT, MPUMALANGA PROVINCE.**

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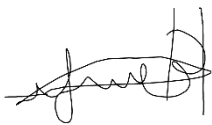
November 2020

Location:

Fauna Park

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DECLARATION OF INDEPENDENCE

I, Humbulani Munzhelele, in my capacity as a specialist consultant, hereby declare that:

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

Humbulani Munzhelele

Wetland Ecologist

Africa Ecological and Development Services (Pty) Ltd.

21st November 2020

1. Introduction

Nkanivo Development Consultants has appointed Africa Ecological and Development Services to undertake wetland delineation and assessment specialist report for the proposed township development, to be situated on the remainder of the farm Matabula 701 JU, referred to as the Sikhwahlane, within the Nkomazi Local Municipality, Mpumalanga Province (**Figure 1**). The project area is approximately 260 hectares in extent.

The main focus for the study is the identification, delineation and assessment of wetland areas that may be directly impacted on by the township development, with a general wetland identification and delineation for systems within the 30 m, 100 m and 150 m river buffer zone of the project. Furthermore, the study is conducted in order to provide a description of the current ecological integrity and impacts pertaining to any township development activities and wetland systems that may be impacted by the construction of the proposed development, as well as providing appropriate management recommendations to mitigate the impacts on the water resources systems. The study is conducted to meet the requirements of a wetland ecological specialist assessment.

Site visit was conducted over two days on the 14th and 15th November 2020, and this would constitute a wet season survey. This report, after taking into consideration the findings and recommendation provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making with regards to the wetland functionality assessment.

1.1. Aims of the study (Project Terms of Reference)

The aims of the study are to:

- Verify the occurrence and typology of wetlands on the study site as delineated through desktop methods, and to correct the delineation based on field-based assessment, thus enabling all wetlands on the study site to be mapped.
- Assess all wetland areas on the study site in the field
- Based on the field assessment gain an understanding of the characteristics of the wetland, including hydrology, vegetation, soils and geomorphology.
- Assess the impacts of the proposed development on the wetland, and suggest suitable mitigation measures, if relevant, to ameliorate or remove these predicted impacts.

- Conduct Wet-Health for the determination of Present Ecological State (PES) of the wetland
- Conduct Wet-Eco Services for determination of ecosystem services.

1.2. Assumptions and Limitations

Only wetlands within the boundaries of the study site were assessed as part of this study. The wetland survey was undertaken in the summer (early November). This entails that the wetland was assessed during the early summer growing season. Although there was some vegetative component that were still propagating or germinating, this did not lower the confidence in the delineation as the wetland delineation is also based on primarily the analysis of soil-based indicators, terrain unit indicators, hydromorphic unit indicators and water table and zonation. The predominantly grassy vegetation still displayed sufficient inflorescences in order to broadly identify the vegetative composition within the wetland.

The primary aim of this wetland assessment study was the delineation of the wetland, and stipulation of the buffer surrounding the wetland, in line with the stipulations of the Department of Water Affairs (DWA) (DWA, 2005), as well as the identification of potential impacts on the wetland associated with the proposed township development, as part of the EIA studies being undertaken for the proposed project. Although no water use licence process is being undertaken for the proposed development, a wider assessment of the functionality and present ecological state of the wetland have been undertaken to augment the scope of this study.

1.3. Definitions and the Legislative Framework.

The construction of the proposed township development should take cognizance of the legislative requirements, policies, guidelines and principles of the relevant regulatory documents such as the National Spatial Development Framework, the Nkomazi Local Municipality Integrated Development Plan (IDP) and Biodiversity Plan and the National Environmental Management Act (NEMA).

The National Environmental Management Act (NEMA) outlines several principles that give guidance to developers, private land owners, members of the public and authorities, of which principle number three of the act stipulates that a development must be socially, environmentally and economically sustainable. Section number 4(a) of the Act states that consideration should be given to all relevant factors which include ecosystems disturbance and

loss of biological diversity must be avoided and prevented, and or where they cannot be completely avoided must be minimised and mitigation measures applied; and that pollution and environmental degradation be avoided, and or where such cannot be completely avoided remedial action to the environment be instituted.

2. PROJECT DESCRIPTION

2.1. Site Location and Description (Study area)

The study is located in the north-eastern part of Malelane (Nkomazi), in an area into which the residential area is rapidly expanding over the past years. The proposed development site is thus located in a remnant rural component in the form of vestiges of open space as shown in Figure 1 below. The approximate coordinates in which the site is situated are -25.777769 and 31.772636.

Since the site is currently situated in a rural based context, there is evidence of livestock rearing activities taking place there. Certain types of inland wetlands are common to particular regions of the country. Many of these wetlands are seasonal (meaning that they are dry one or more seasons every year), and particularly in the arid and semiarid west, may be wet only periodically. The quantity of water present and the timing of its presence in part determine the functions of a wetland and its role in the environment. Even wetlands that appear dry at times for significant parts of the year, such as vernal or ephemeral pools, often provide critical habitat for wildlife adapted to breeding exclusively in these areas. For example, the schools of tadpoles were observed in pools and some were in the dry vernal pools areas.

Some other findings from the wetland study conducted from Sikhwahlane wetland site.

A field verification which was conducted on the 14th and 15th of November 2020, revealed that the functional wetland areas which for the purpose of this study are specified as wetland and riparian zones, denoted the following:

- Sedimentation/infilling evidence in the Sikhwahlane ephemeral wetland. This is due to an increase in the deposition of sediments, resulting in the partial or even complete burial of organisms and the alterations of substrates.
- There is a typically evidence of land-use changes, agriculture (For example, cultivation field erected directly within the ephemeral wetland site) (**Figure 4**), settlements within the 15 m radius of the wetland, disturbance of the stream or wetland flow regimes and runoff were noted.

- Due to disturbance on and around the wetland vicinity, there is evidence of decreased sediment trapping by vegetation due to a reduction in the width of buffer-zones around Sikhwahlane wetlands site.
- The Sikhwahlane ephemeral wetland is exposed to human-related stressors, where the wetland is subjected to alteration of the hydroperiod due to a reduction in wetland water levels and water residence time and/or increased frequency, duration, or extent of desiccation of wetlands sediments, since most of the vegetation are removed or cleared.
- The Sikhwahlane wetland area is currently used for livestock grazing (cattles, goats, sheep and donkeys).
- The hydrology of the Sikhwahlane ephemeral wetland system was and is still currently being transformed due to continuous overgrazing and trampling by livestock, human and vehicle, including infrastructure development such as bridges, secondary roads tracks and wetland area crossings and river crossings (**Figure 8**).
- The system, however, still represent typical characteristics of an ephemeral wetland such as wetland soils and vegetation.

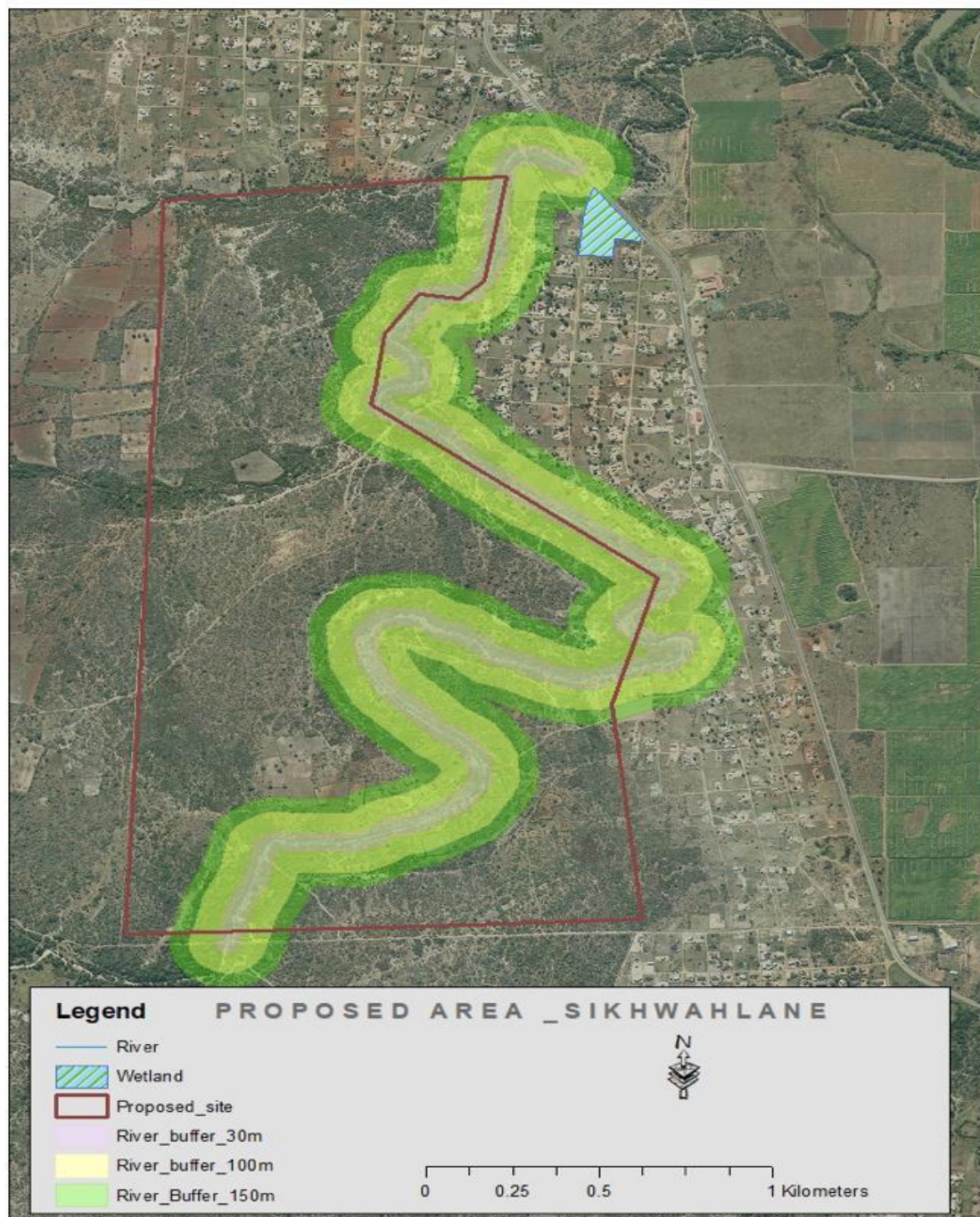


Figure 1: Site Location Map detailing the proposed Township development area. And buffer zone

2.2. Aquatic Vegetation type and Indicator Species.

Vegetation sampling in Sikhwahlane wetland showed large areas of dominant plant species with very little diversity. The wetland was dominated by a typical wetland sedges and reeds and other grasses types (Table 1).

Table 1: Presence of dominant plant species found within the quadrats examined at the Sikhwahlane wetland site.

Family	Taxon	Common name
Asteraceae	<i>Xanthium strumarium</i>	Rough cocklebur
Cyperaceae	<i>Scirpus ancistrochaetus</i>	North-eastern bulrush
Juncaceae	<i>Juncus effusus</i>	Soft rush
Poaceae	<i>Cynodon dactylon</i>	Bermuda grass
Poaceae	<i>Urochloa mosambicensis</i>	Bushveld signal grass
Typhaceae	<i>Typha capensis</i>	Bulrush
Poaceae	<i>Themeda triandra</i>	Red grass
Poaceae	<i>Eragrostis curvula</i>	Weeping lovegrass
Poaceae	<i>Cymbopogon pospischilii</i>	Lemongrass

It is important to note that the Sikhwahlane ephemeral wetlands was dominated by the grasses from the families Poaceae, Juncaceae and Typhaceae. These vegetation species are well suited and adapted to the conditions in ephemeral wetlands conditions (**Figure 2 below**). **These vegetation species have evolved and developed mechanisms for maturing and growing fast in order to withstand the unfavourable and unpredictable conditions.**



Figure 2: Picture showing some of the ephemeral wetlands plants at Sikhwahlane ephemeral wetlands site.

2.3. Fauna Biodiversity recorded at Sikhwahlane Wetland site during the survey on the 14th and 15th November 2020.

2.3.1. Aquatic Macroinvertebrates.

Invertebrates samples were dominated by the hemipterans Notonectidae (*Anisops spp*) and Corixidae (*Sigara spp*). There was a very low biodiversity of invertebrates but high numbers or abundance of those taxa present. The taxa identified are all very tolerant of a wide range of water quality and adapted to low levels of oxygen. Some have the capability to burrow themselves beneath the mud to complete their growing phases in case the ephemeral wetlands ponds become dry out or desiccated. Some of the observed invertebrates recorded are shown in Table 2 below.

Table 2: Presence of aquatic macroinvertebrates species examined in the Sikhwahlane Wetland site.

Order	Family	Taxon	Common name
Hemiptera	Corixidae	<i>Hesperocorixa castenea</i>	Water boatmen
Hemiptera	Naucoridae	<i>Ilyocoris cimicoides</i>	Creeping water bugs
Hemiptera	Notonectidae	<i>Notonecta maculata</i>	Backswimmers
Hemiptera	Nepidae	<i>Nepa cinerea</i>	Water scorpion
Diptera	Chironomidae	<i>Chironomous spp</i>	Midges
Mollusca	Lymnaeidae	<i>Lymnaea columella</i>	Reticulate pond snail
Diptera	Tabanidae	<i>Tabanus sulcifrons</i>	Horse flies

It is important to note that the aquatic invertebrate families recorded at the Sikhwahlane ephemeral wetlands (Table 2 above) are dominated by species from the order Hemiptera and Diptera. It is important to note that most of the species from these orders or families are airbreathers and adapted to life in ephemeral wetlands or vernal ponds conditions. When condition in the aquatic environment become unsuitable or desiccated and not supporting the livelihoods, these species do take another form so that they can survive terrestrial.

2.3.2. Bird biodiversity surveyed in Sikhwahlane ephemeral wetland site.

Despite some disturbance of the Sikhwahlane wetland site, the bird life was seen to be thriving. Most of the birds are perceived to be around the wetlands sites for ecological benefits such as breeding, feeding and protection. Birds that were readily recognisable were recorded (Table 3).

Table 3: List of birds recorded on the 14th and 15th November 2020 at the Sikhwahlane wetland site and their abundance on the days of survey.

Common name	Species name	Abundance
Cattle egrets	<i>Bubulcus ibis</i>	++++
Brown-hooded kingfisher	<i>Halcyon albiventris</i>	++
Blue Waxbill	<i>Uraeginthus angolensis</i>	++++
Dark-capped Bulbul	<i>Pycnonotus tricolor</i>	++++
Cape Sparrow	<i>Passer melanurus</i>	++++
Hammerhead bird	<i>Scopus umbretta</i>	++
White-throated Swallow	<i>Hirundo albigularis</i>	++++
Fork-tailed Drongo bird	<i>Dicrurus adsimilis</i>	++
Grey heron	<i>Ardea cinerea</i>	+
Green-winged Pytilia	<i>Pytilia melba</i>	++++
African Masked Weaver	<i>Ploceus velatus</i>	++++
Red-billed quelea	<i>Quelea quelea</i>	++++
Spur-winged lapwing	<i>Vanellus spinosus</i>	++++
Laughing dove	<i>Streptopelia senegalensis</i>	++++
Cape turtle-dove	<i>Streptopelia capicola</i>	++++
Red-faced mousebird	<i>Urocolius indicus</i>	++++
Little Bee-eater	<i>Merops pusillus</i>	++

+ (one individual), ++ (two individuals), +++ (three individuals) and ++++ (four or more individuals), denote the abundance level.

2.3.3. The Anurans or amphibians identified from the Sikhwahlane ephemeral wetlands sites.

Suitable environmental conditions, especially at breeding sites are critically important to frogs, and most species tend to be located in specific habitats such as wetlands and rivers (Du Preez and Carruthers, 2017). The frogs are shown in Table 4 below.

Table 4: List of frogs recorded on the 14th and 15th November 2020 at the Sikhwahlane wetland site survey.

Family	Species name	Common name
Racophoridae	<i>Chiromantis xerampelina</i>	Foam nest frogs
Pipidae	<i>Xenopus laevis</i>	African clawed frog

It is important to note that these frogs are plentiful in ponds and rivers respectively. They are aquatic and highly adaptable and will lay their eggs whenever conditions allow it. During wet rainy seasons they will travel to other ponds or vernal pools of water to search for food. During drought times these frogs burrow themselves in the mud, becoming dormant for up to a year. This is indeed one of the mechanisms these frogs use to survive the unpredictable and harsh environment of the ephemeral wetlands. These frogs were noticed to have laid many eggs in the Sikhwahlane ephemeral wetlands in order for their offspring (tadpoles) to survive the unpredictable conditions (**Figure 3**), even if some offspring may die some will stand a high probable chance of surviving depending on the area they are located on within the wetland system. It is also important that the Sikhwahlane ephemeral wetlands should be protected from impacts and degradation in order for these frogs species to thrive in this unique freshwater environment. The erection of cultivation field, vehicle activity traversing the wetland area and removal of vegetation are some of the impacts that could pose threats to these anurans families in the Sikhwahlane ephemeral wetlands sites.



Figure 3: The picture showing the tadpoles of the species *Xenopus laevis* in a drying pond of Sikhwahlane ephemeral wetlands site.

3. METHODOLOGY FOR ASSESSMENT

3.1. Wetland Field Assessment

The wetland area as delineated by desktop methodology prior to this study was visited in the field, focusing on the boundaries of the wetland area. Use was made of a GPS to identify important points (e.g. wetland boundaries). These GPS points were converted into a GIS shapefile to allow these points to be mapped and to facilitate the correction of wetland boundaries and the identification of very sensitive wetlands portions within the study area.

3.2. Wetland Delineation

In determining the zone of the wetlands require the delineator to give consideration to specific indicators. The indicators must always be present in the wetlands, and under normal circumstances vegetation indicator is deemed to be primary indicator. Soil indicator tends to be the most important indicator, and the other two indicators (The Terrain Unit and Soil Form Indicators) are used for confirmatory purposes (DWAF, 2005).

The National Water Act (Act 36 of 1998) defined wetland as a “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 the land in which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil”.

Wetland based delineation and sampling of wetland was based upon the DWAF guidelines “A practical field procedure for the identification and delineation of wetlands and riparian areas” (DWAF, 2005), which stipulates that consideration be given to four specific wetland indicators to determine the boundary of the wetland. These indicators are: terrain unit indicator, soil form indicator, soil wetness indicator and vegetation indicator.

This according to the DWAF (2005) guidelines for the delineation and identification of wetlands, soil wetness indicators are the most indicator of wetland occurrence, due to the fact that soil wetness indicators remain in wetland soils, even if the wetland site is degraded or drying out.

3.3. Wetland Functional Assessment

Wetland functionality is defined by Macfarlane *et al.* (2007), as a measure of the deviation of wetland structure and function from its natural reference condition. The natural reference condition is also based on a theoretical undisturbed state which is derived from an understanding of undisturbed regional vegetation and hydrological conditions knowledge (Macfarlane *et al.*, 2007). Kotze *et al.* (2007) emphasized that the wetland systems are critical for groundwater recharges, although flows through them are supplemented by surface water contributions from rain. Kotze *et al.* (2007) further reported that wetlands serve as unit for ecological services and a functional wetland system could contribute to the following: surface flow attenuation, contribution of water to the stream during dry seasons, provide water quality

enhancement benefits, and as such the systems have a high potential to remove nitrogen and nitrates as well as carbon sequestration.

3.4. Determination of the Present Ecological Status (PES) of wetlands

WET-Health is a tool designed to assess the health or integrity of a wetland. Wetland health on the other hand is defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition. This technique is used to assess hydrological, geomorphological and vegetation health in the form of ecological status categories and descriptions as shown in Table 5 below.

Table 5: The Present Ecological Status (PES) categories and descriptions for WET-Health (Adapted from Macfarlane *et al.*, 2007).

Category	Description	Range
A	Unmodified, natural	0-0.9
B	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9
C	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9
D	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.5-5.9
E	The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable	6-7.9
F	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10

3.5. Determination of the Ecological Importance and Sensitivity (EIS) of Wetlands.

The ecological importance is an expression of a wetland's importance to the maintenance of ecological diversity and functioning on local and wider spatial scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (MacFarlane *et al.*, 2007). Water resources can be classified for an

appropriate management class based on EIS. The EIS allows classification of ecological importance in ecosystems and biodiversity for the estimation of species diversity and abundance. The EIS use the rating scale for the estimation of scores (**Table 6**). Furthermore, these wetlands provide specialized habitat and dispersal corridors and basic human needs such as subsistence farming and water use.

Table 6: Ecological Importance and Sensitivity rating scale used for the estimation of scores.

Ecological Importance and Sensitivity Categories	Rating
<p>Very High</p> <p>These are wetlands that are considered ecologically important and sensitive on a natural or even international level. Biodiversity of these wetlands is usually very sensitive to flow and habitat alterations. They moderate the water quality and quantity of major rivers.</p>	>3 and ≤4
<p>High</p> <p>These wetlands are considered to be ecologically important and sensitive. Biodiversity of these wetlands may be sensitive to flow and habitat alterations. Plays a role in moderating the quantity and quality of water of major rivers.</p>	>2 and ≤3
<p>Moderate</p> <p>These wetlands are considered ecologically important and sensitive at a local or provincial scale. Biodiversity in these wetlands is not usually sensitive to flow and habitat alterations. However, they play a small role in moderating the quantity and quality of water in major rivers.</p>	>1 and ≤2
<p>Low/Marginal</p> <p>Wetlands that are not ecologically important and sensitive at any site. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat alterations. However, they play a role in moderating the quantity and quality of water in major rivers.</p>	>0 and ≤1

3.6. Determination of Buffer Requirements

The pre-mitigation buffer requirements for the construction and operational phases are 30 m, 100 m and 150 m for river and wetlands sites respectively. These buffer requirements are relevant to all the delineated wetlands sites and should be ideal after the successful application of recommended mitigation measures.

4. Results and Discussions

4.1. Functions and values of the Sikhwahlane Wetlands

Due to the vernal pools or ephemeral pools that are created in the Sikhwahlane wetlands, such an environment is unique in nature and is considered to be good in provision of habitat for numerous rare plants and animals that are able to survive and thrive in these harsh and ever changing conditions. Many of these plants and animals spend the dry seasons as seeds, twigs, rhizomes, eggs or cysts, and then grow and reproduce when the ponds are again filled with water. In addition, birds such as egrets, ducks, hawks, kingfishers use vernal pools as a seasonal source of food and water.

Due to the seasonal nature of the pools, both animals and plants living there have some adaptation to help them survive in these challenging environments. There are three basic types of strategies that mostly animals and sometimes plants use in order to survive and adapt, namely: getting off to a fast start; mature early or rapidly and live a prolonged period of time without water.

The facultative species include most of the other remaining frogs, few reptiles, fingernail clams, snails, insect larvae (dragonfly, damselfly, caddisfly larvae, water scorpion, gyridae, veliidae, naucoridae, corixidae) and leeches. The major branchiopod crustaceans (generally of facultative ephemeral wetland taxa: Cladocera (Genus: *Daphnia pulex*) were present in the water.

4.2. Status of the Sikhwahlane Wetland proposed development area

The Sikhwahlane vernal pools are valuable and indications are that they are increasingly a threatened ecosystem due to human activities such as settlements, field for ploughing and vehicle activity, dumping of waste (**Figure 9**), trampling by livestock, digging and excavation for water and soil, sand and gravel, overgrazing and removal of vegetation. Most of the vernal or ephemeral pools have already been lost and great efforts should be made to protect the Sikhwahlane Wetland pools, as their disturbance and disappearance will mark the loss of rare

and important habitat and some of the associated plant and animal species as well. In general, the loss of ephemeral wetlands due to land alterations and insufficient protections has vast ecological and social consequences.



Figure 4: Picture of a cultivation field in the wetland



Figure 5: Picture of water pipeline installation activities that created cracks on the wetland



Figure 6: Picture indicating the determination of hydric soils for classification purposes.



Figure 7: Removal of valuable vegetation to make way for cultivation fields.



Figure 8: Picture of vehicle activity and road traversing the wetland area



Figure 9: The dumping of waste (diapers and glass bottles in the Sikhwahlane wetland site.

4.3. Wetland Delineation (soils, vegetation and soil wetness indicators)

Accordingly, all of the “wetland indicators” including soil wetness and vegetation indicators as well as the analysis topography (land form unit) and site hydrology were considered in the identification and delineation of wetland areas in the study area at Sikhwahlane site. Under most circumstances the most important indicator of the presence of hydric soils is the soil wetness indicator, i.e. examination of redoximorphic features within the soil (Collins, 2005).

4.4. Wetland Soils

The findings from the determination of wetland soils indicated that the Sikhwahlane ephemeral wetlands site is dominated by loamy-clay type of soil. The Sikhwahlane ephemeral wetlands had shown that one main wetland soil form is dominant within the delineated wetland areas during the site visit. Signs of wetness within the soils studied on site lacks the typical mottling usually found in wetland soils. The reason for this phenomenon may be due to the lack of iron in the soil. It is however important to note that another property of wetland soils known as gleying can be seen within the Sikhwahlane ephemeral wetlands sites as illustrated in **(Figure 10)**.



Figure 10: Evidence of soil type identified during the Sikhwahlane ephemeral wetlands site visit.

4.5. Description of Wetland Type

Ephemeral wetlands are formed in closed depressions lacking a surface outlet and are wet only seasonally or in wet years. Depressions in Sikhwahlane wetlands are in an inward draining basins with an enclosing topography which allows water to accumulate within the system.

4.6. Present Ecological Status

The Present Ecological Status (PES) for the assessed Sikhwahlane wetland system, the ephemeral or vernal pool is presented in Table

The Sikhwahlane ephemeral wetland is in a Category D: Largely modified. The hydrological processes and vegetation of the wetland have undergone the most significant alterations, primarily due to impacts associated with the extensive agricultural activities (**Figure 4**). Additionally, impacts such as informal road traversing the wetland area (**Figure 8**), and pipeline crossings that have resulted in soil disturbances (**Figure 5**), showing developing cracks and soil instability. In so doing, the assessed area of the wetland is deemed to be in a largely modified condition (Category D).

4.7. The Ecological Health Assessment

The hydrology of Sikhwahlane ephemeral wetlands sites has been “Critically Modified (F)” due to the disturbance in the various surface water runoff drainage system disturbed.

The Geomorphology component of the ephemeral wetlands area has been scored “Largely Modified (D)” due to certain impacts identified as being a threat for the Sikhwahlane ephemeral wetland system. The identified impacts in this regard include the changes in run-off characteristics due to high concentrations of storm water drains, township development and the formation of eroded gullies.

The vegetation aspect of the Sikhwahlane ephemeral wetlands site has been scored a “Largely Modified (D)” score. The main aspect contributing to this rating is attributed to the development of the Sikhwahlane Township development area. Since the construction and operation of the infrastructure involves clearing indigenous vegetation and covering soil surfaces which inhibits smooth water infiltration and substantially increases run-off.

4.8. The EIS Assessment of the Remaining Wetland Areas

The EIS Category of the Sikhwahlane ephemeral wetlands was determined according to Kotze et al. (2007). The findings of the EIS assessment indicates that the wetland is deemed to be of moderate ecological importance and is therefore designated a Sensitivity Category C score (Table 5). This is largely attributable to the hydrological-functional importance of the system, primarily due to its perceived ability to regulate streamflow, runoff and, control erosion. This is because these wetlands are considered ecologically important and sensitive at a local scale. Although the biodiversity in these wetlands is not usually sensitive to flow and habitat alterations. However, they play a small role in moderating the quantity and quality of water in major rivers.

4.9. Buffer Requirements

The recommended buffer zone applicable to the proposed township development project are 30 m for the operational phase and 100 and 150 m for the construction phase. The buffer zones for the vernal pools or ephemeral wetlands should be implemented in order for the activities not to encroach on the Sikhwahlane wetland study site.

4.10. IMPACT ASSESSMENT

4.10.1. IMPACT AND MITIGATION MEASURES

A development has several impacts on the surrounding environment and particularly on a wetland. The development changes the habitats, the ecological development infiltration rates, amount of runoff and runoff intensity and the hydrological regime of the site including the watercourse.

4.10.2. RECOMMENDATIONS

Recommendation 1: Wetland monitoring and assessment programmes.

Consistent, thorough and timely wetland monitoring and assessment programmes are a critical tool for municipality and community to better manage and protect their wetland resources. These programmes if considered can enhance the following attributes, namely:

- Establishment of a baseline in wetland extent, condition and function
- Detect change, and
- Characterize trends within and around the wetlands over time

Wetlands monitoring and assessment data can be used to help make decisions in:

The National Water Act, 36 of 1998 regulatory programmes

Wetland restoration and watershed planning

The development of meaningful water quality standards for wetlands

Recommendation 2: No construction may take place within the wetlands or 100 m zone of regulation and such an area should be demarcated as a no go area.

5. NATURE OF THE POTENTIAL IMPACTS ON WETLANDS ASSOCIATED WITH THE PROPOSED TOWNSHIP DEVELOPMENT

5.1. Impact Assessment

The impact assessment consider both direct and indirect impacts, if any, to the wetland systems. The area to be developed will consist of freestanding structures. The layout of the proposed project could have a potential to encroach into the wetlands and associated buffers of Sikhwahlane wetlands sites. If the mitigation measures are not taken into consideration the impacts could possibly reduce the ability of the wetland to perform many of the functions associated with this kind of ecosystems. If the wetland area could loose its integrity, the implications could be that it cannot control and manage stormwater, sediment trapping and

trapping of pollutants and ultimately sediments. There could be a further biodiversity value reduction in case the wetland loses its functionality and ecological health status.

Table 7: Impacts assessed for the proposed Sikhwahlane Township Development Project

Impact	Aspect
Construction phase	Removal of vegetation
Impeding on flow paths entering	Excavations for foundations and servitudes
Siltation	Clearing of area for infrastructure
Sedimentation	Hardening of surface areas
Eutrophication	Vehicle activity
Water quality impairment	Domestic and industrial waste
Operational phase	Increase in hardened surfaces
	Wetland drainage patterns change
	Traffic and vehicle activity
	The roadkills of fauna species particularly frogs, snails, birds and reptiles that could try to negotiate or transverse the main road to the other side of the road habitat.

5.2. Associated Mitigation Measures

The mitigation measures that should be considered for the township development are as follows:

- The delineated wetland areas must be avoided where possible. Where possible, the construction of the houses must take place from the existing road and not from within the wetland areas.
- Prevent uncontrolled access of vehicles through wetlands that can cause a significant adverse impact on the hydrology and soil structure of the wetland areas which could also lead to the compaction of soils and in some instances enhanced soil erosion.

5.3. Impact Rating Matrix before and after mitigation measures for Sikhwahlane wetlands sites.

The impact assessment rating matrix assessment of wetland loss before mitigation is shown in Table 8, and the one after application of mitigation measures is in Table 9 below.

Table 8: The Impact Assessment Matrix of Sikhwahlane Wetland loss before mitigation measures.

Criteria	Description	Score
Extent	The loss of wetlands is likely to have a local impact, as the catchments found within the proposed township development could feed directly to the wetland system	2
Duration	The loss of wetland is likely to be permanent, as the portions in the Sikhwahlane wetland could be destroyed permanently	4
Intensity	Given the largely modified or degraded nature of the wetlands on site, it is likely that the intensity will be moderate	2
Probability of occurrence	The proposed layout could definitely destroy wetland habitat	4

Significance of the impact: The impact of the proposed township development on site is likely to have a very high negative impact if mitigation measures are not taken into consideration.

Table 9: The Impact Assessment Matrix of Sikhwahlane Wetland loss after mitigation measures.

Criteria	Description	Score
Extent	The loss of wetlands is likely to have a site impact, as the catchments will be rehabilitated	1
Duration	The loss of wetland integrity is likely to be short-term, as the Sikhwahlane wetlands will have an offset of negative impacts by rehabilitation	1
Intensity	Given the degraded or alterations nature of the wetlands areas, it is likely that the intensity will be moderate.	2

Probability of occurrence	The proposed development offset will possibly reduce the loss of Sikhwahlane wetlands site	2
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Significance of the Sikhwahlane wetlands impact: The impact of the township development is likely to have a low negative impact should the wetland be conserved and rehabilitated and treated as a no go area following the buffer zone requirements.

6. CONCLUSIONS

A seasonal or ephemeral vernal flat and pool type of wetland has been identified on the site of the proposed Sikhwahlane Township Development. The wetland occupies a part of the eastern area on the site. The presence of the wetland is important for the development, as the wetland must not be affected in any way by the proposed development. The wetland area and associated buffer must be kept free from all or further development, including linear developments (i.e. roads) and underground services (pipelines etc.).

The most important potential impacts that the proposed development could exert on the wetland relate the indirect impact that could be brought about by stormwater discharge. It is important that stormwater from the surrounding proposed development be of “soft” engineering in the stormwater design is strongly recommended, as these will likely prevent most of the impacts associated with the stormwater discharge.

Based on the findings of the wetland ecological assessment, it is the opinion of the wetland ecologist that the proposed township development poses a moderate risk to the integrity of the methods associated with the Sikhwahlane ephemeral wetlands and the adjacent unnamed stream. It is therefore of utmost importance that the adherence to recommendations and ecologically sensitive site development plans, and the mitigation measures provided in this report should be ideal for general good construction practice and ongoing management, maintenance and monitoring of perceived impacts to limit further degradation of the freshwater environment. Furthermore, it is also the opinion of the wetland ecologist and freshwater specialist that the proposed township development from a freshwater resource management perspective is acceptable provided no development takes place within the wetlands or the associated 100 m zone or so of regulation, dumping of wastes (diapers and glass bottles) are

eliminated, and that strict adherence to mitigation measures is enforced to ensure that the ecological integrity of the freshwater environment is not further compromised.

The mitigation measures and recommendations listed herein should be adhered to as to ensure wetland areas associated with the township development as well as surrounding environment are protected.

7. REFERENCES

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