SPECIALIST REPORT

Wetland Assessment
Portion 1 of the farm Newington 255KU, Bushbuckridge Local Municipality, Ehlanzeni District Municipality Mpumalanga Province

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Version 1

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Specialist Environmental & Biodiversity Assessments

Specialist declaration

I, Danie van der Walt, declare that -

- I act as an independent specialist in this application;
- I have performed the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity;
- I have expertise in conducting the specialist report relevant to this application, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the relevant environmental legislation, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in this project;
- I undertake to disclose to the applicant and the authorities 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 report are true and correct.

L.D. VAN DER WALT

Date: 2021-04-09

EXECUTIVE SUMMARY

The applicant intends to demarcate stands on the property. The total property area is approximately 88.41Ha in extent. Environmental authorization of regulated activities is required before commencement of the activity. As partial requirement in support of Environmental Legislation as well as Water Use License Applications (WULA) the environmental consultant appointed *Afrika Enviro & Biology* to investigate and report on the status of wetlands / watercourses that are present and may be affected.

The study area is located within quaternary degree grid 2431AC, within the Inkomati-Usuthu Catchment Management Area (Primary Catchment X), and more specifically within quaternary catchment X32G (Sand River). According to the River Health Programme (WRC, 2001), the site is located in the *Lowveld Ecoregion* (3). The property is approximately 88.41Ha in size and is more or less rectangular in shape and shaped along a north – east to south –west axis. The property is located immediately to the south of the village called Dumphries in the extreme eastern side of the Local Municipality. The area is subject to tribal traditions and rural activities consisting of small cultivated lands and rearing of cattle is practiced. The Sabi-Sand Private Nature Reserve is located a short distance to the east. Informal settlements are encroaching into the natural environment on the edge of the village. There are no rocky outcrops present on site, potential wetland zones are present and were investigated. The biophysical features and habitat delineation of the study sites are projected on an aerial image.

As result of the flat topography on the central section, seasonal flat wetlands are formed in this area when periods of heavy rain are experienced. The wet conditions may continue for a prolonged period of time depending on soil saturation and the depth of the water table. Subsurface flow is directed in this direction when the soil is saturated during and after the rainy season. It is suspected that a shallow hard subsurface horizon is present, creating a perched water table that comes to the surface in places as seepage flow as the predominantly sandy soil is ideal for the formation of seepage wetlands. The wetlands form part of a larger drainage basin situated in the valley bottom central to the wetlands. Two ephemeral drainage lines flow from this basin towards the north and west. This area is typified by scattered large trees of the species *Sclerocarya birrea* and *Diospyros mespiliformis.* Terrestrial vegetation is present on the edges and in-between the wetland pockets, making it quite difficult to delineate each and every pocket as there are numerous pockets of various sizes.

The overall PES for the combined wetland units is calculated as a category B = Largely natural category: *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.* The trend is negative and encroaching informal settlements and loss of vegetation is a serious concern at present. The EIS of the wetland is calculated to be *Moderate.* The Risk Matrix calculates a ***Low*** Risk Class, suggesting that a General Authorisation for the water use is applicable. A 20m buffer zone is recommended to protect the wetlands and hydrological features. The ecological functions and overall condition of the wetland can be maintained and improved by simple rehabilitation tasks, maintenance of infrastructure and preventative measures, especially alien invasive vegetation control, erosion control and not allowing illegal sand mining and encroaching informal settlements. The investigation and assessment concludes that the aquatic ecosystems and wetlands will not be significantly affected by the proposed activities if the appropriate buffer zone and mitigation measures are adhered to. The wetlands and sensitive biota will be protected within a buffered conservation area. Generic mitigation measures will apply with regards to alien invasive vegetation, pollution, erosion/sedimentation and other environmental aspects.

CONTENT

1. Introduction

1.1 Background and objectives

The applicant intends to demarcate stands on the property. The total property area is approximately 88.41Ha in extent. Environmental authorization of regulated activities is required before commencement of the activity. As partial requirement in support of Environmental Legislation as well as Water Use License Applications (WULA) the environmental consultant appointed *Afrika Enviro & Biology* to investigate and report on the status of wetlands / watercourses that are present and may be affected. The assessment is completed in sequence to report on the aspects as required by the DWA *supplementary water use information* document for Section 21(c) and (i) water uses (DW781suppl & DW775 suppl). Additional terms inclusive of the last mentioned are:

- Identify wetlands and riparian zones within the study area and surrounds;
- Delineate watercourses on site using the DWAF 2005 / 2008 wetland and riparian delineation guidelines;
- Prepare a desktop report on the PES; ES and EI of the sub-quaternary catchment and river reach using available data and tools provided by DWS.
- Perform functional assessments of the wetlands affected by the proposed activities using the WET-Eco Services tool;
- Determine the present ecological state (PES) of the wetlands affected by the proposed activities using the WET-Health tool;
- Compilation of maps and shape files to project the findings of the investigation.
- Conduct an impact assessment and give recommendations and mitigation measures;
- Apply the GN509 Water Use Risk Assessment Matrix for WULA.
- The investigation must comply with MTPA minimum requirements for environmental study reports.

The study site was investigated on 2020-09-07; 2020-11-19; 2020-12-17; 2021-02-08.

1.2 Specialist report requirements

With reference to Appendix 6 of the EIA regulations (2014) the specialist declaration is included on page 2 of this report and details and the specialist's curriculum vitae are included with Appendix 1. The investigation complies with the requirements of the Mpumalanga Tourism and Parks Agency (MTPA) *Minimum requirements for environmental study reports when applying for authorization for an activity that may have a detrimental effect on the environment.*

1.3 Assumptions and uncertainties

The results and recommendations of the report are based on the actual site status. Assumptions that are made and uncertainties that are encountered are indicated in the report (where applicable). As indicated under the relevant sections in the report consultation of authorities' data bases forms part of this report. However, the scope of work for this specialist report does not include public participation.

2. Methods and Reporting

2.1 National & Provincial conservation status

The following available data bases were consulted:

i) The ***Mpumalanga Biodiversity Sector Plan*** (MBSP) is a systematic biodiversity planning tool formulated by the provincial nature conservation authority, Mpumalanga Tourism & Parks Agency (MTPA, 2014).

ii) The ***National Freshwater Ecosystem Priority Areas*** (NFEPA)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), SANBI, DWS, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development. The National Freshwater Ecosystem Priority Areas (NFEPA) project provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. These priority areas are called Freshwater Ecosystem Priority Areas, or 'FEPAs'. FEPAs were identified based on:

- Representation of ecosystem types and flagship free-flowing rivers.
- Maintenance of water supply areas in areas with high water yield.
- Identification of connected ecosystems.
- Representation of threatened and near-threatened fish species and associated migration corridors.
- Preferential identification of FEPAs that overlapped with:
    - Any free-flowing river or Priority estuaries identified in the National Biodiversity Assessment 2011.
    - Existing protected areas and focus areas for protected area expansion identified in the National Protected Area Expansion Strategy.

The NFEPA database was consulted to determine the conservation status of wetland habitat and wetland systems present within the study area.

iii) **The Department of Water and Sanitation Desktop PES-EIS Assessment** (DWS, 2014), provides the current status of sub-quaternary river reaches (SQRs) for South Africa. A summary of the PES, Ecological Sensitivity (ES) and Ecological Importance (EI) are available on this data base.

2.2 Watercourse classification & delineation

2.2.1 DWAF Delineation guidelines

It is important to differentiate between different types of watercourses and in particular wetlands and riparian habitats. Riparian zones are not wetlands, however, depending on the ecosystem structure; wetlands can also be classified as riparian zones if they are located in this zone (e.g. valley bottom wetlands). Although these distinct ecosystems will be interactive where they occur in close proximity it is

important not to confuse their hydrology and Eco-functions. These delineations are performed according to *"A practical field procedure for identification and delineation of wetlands and riparian areas"* as amended and published by the Department of Water Affairs and Forestry (2005); an updated draft version of this report is also available and was also considered during the wetland delineation (DWAF, 2008). (Henceforth referred to as DWAF Guidelines). Aerial photographs and transects on foot were used to determine the different features and potential wetland and riparian areas of the study area. The morphology and geophysical features of the watercourse is investigated and described as part of these procedures. The classification of the type of watercourse/s present on site is discussed in section 4.1. In addition to the DWAF Guidelines (2005), the unpublished notes: *Draft riparian delineation methods prepared for the Department of Water Affairs and Forestry, Version 1* (Mackenzie & Rountree, 2007) were used for classifying riparian zones encountered on the property according to the occurrence of nominated riparian vegetation species.

Definitions

For the purpose of this report, the definitions of these ecosystems as described by the National Water Act (1998) are used:

- A watercourse is defined as:
  (a) a river or spring;
  (b) a natural channel in which water flows regularly or intermittently;
  (c) a wetland, lake or dam into which, or from which, water flows; and
  (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse and a reference to a watercourse includes, where relevant, its bed and banks.
- A wetland is described 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 land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."*
- Riparian zones are described as *"the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent areas"*
- Extent of a watercourse:
  (a) The outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; and
  (b) Wetlands and pans: the delineated boundary (outer temporary zone) of any wetland or pan.

Riparian zones are not wetlands, however, depending on the ecosystem structure; wetlands can also be classified as riparian zones if they are located in this zone (e.g. valley bottom wetlands). Although these distinct ecosystems will be interactive where they occur in close proximity it is important not to confuse their hydrology and

ecofunctions. The DWAF manual for *Section 21(c) or (i) Water Use Authorization* (Roets, 2016) is another publication that is employed with riparian and aquatic investigations.

The following biophysical indicators are used for wetland identification and delineation:

- Terrain Unit Indicator; Soil Form Indicator; Soil Wetness Indicator; Vegetation Indicator.

Wetlands must have one or more of the following attributes or indicators:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation. The soil forms (categories in the classification system) common to South African wetlands are Champagne, Katspruit, Willowbrook and Rensburg. The Champagne form consists of a soil layer with greater than 10% organic carbon. The others are all characterised by the presence of a G horizon (i.e. a gleyed soil layer) immediately below the surface horizon. There are also other soil forms which are found mainly in non-wetland areas but which are also found in temporary wetlands. These include the Kroonstad, Westleigh, Longlands and Estcourt. The Dundee form is found near rivers but it is generally well drained and would not be considered a wetland soil.
- The presence, at least occasionally, of water loving plants (hydrophytes);
- A high water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50cm of the soil. Indicated by mottling and gleying.

In order for an area to be classified as a wetland by the DWAF guidelines, it must meet one or more of the abovementioned criteria. If an area is classified as wetland according to the abovementioned criteria further investigation may be necessary to determine the integrity of the wetland. For this purpose, The WET-Health (Macfarlane et al. 2009) methodology is used to evaluate the integrity and the present ecological state of wetlands (PES).

2.2.2 **Classification System for Aquatic Ecosystems**

The wetland system encountered within the study area was assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems, hereafter referred to as the “classification system” (Ollis et al., 2013). According to this manual a wetland is referred to as a hydro geomorphic unit (HGM) and these are subcategorized according to the following hierarchy:

Level 1: Inland systems: Ecoregion

For the proposed Classification System, Inland Systems are defined as an aquatic ecosystem that have no existing connection to the ocean4 (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but which are inundated or saturated with water, either permanently or periodically. For Inland Systems, the regional spatial framework that has been included at Level 2 of the proposed Classification System is that of DWA’s Level 1 Ecoregions for aquatic

ecosystems (Kleynhans et al., 2005). There are a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland (figure below). D

Level 2: Wetland vegetation group

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford, 2006) groups vegetation types across the country according to Biomes, which are then divided into Bioregions. To categorise the regional setting for the wetland component of the NFEPA project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting Bioregions into smaller groups through expert input.

Level 3: Landscape Setting

A distinction is made between four Landscape Units on the basis of the landscape setting (i.e. topographical position) within which a hydro geomorphic unit (HGM) is situated, as follows (Ollis et al., 2013):

- Slope: an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.
- Valley floor: The base of a valley, situated between two distinct valley side-slopes.
- Plain: an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land.
- Bench (hilltop/saddle/shelf): an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes and up-slopes), and shelves / terraces / ledges.

Level 4: Hydro geomorphic Units

Eight primary HGM Types are recognised for Inland Systems at Level 4A of the classification system, on the basis of hydrology and geomorphology:

- River: a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
- Channeled valley-bottom wetland: a valley-bottom wetland with a river channel running through it.
- Unchanneled valley-bottom wetland: a valley-bottom wetland without a river channel running through it.
- Floodplain wetland: the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank.
- Depression: a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates.
- Wetland Flat: a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat.

- Seep: a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), uni-directional movement of material down-slope. Seeps are often located on the side-slopes of a valley but they do not, typically, extend into a valley floor.

Level 5: Hydrological regime

Describes the behavior of water within the system and, for wetlands, in the underlying soil:

Perennial vs. non-perennial (Level 5A)

- Perennial—flows continuously throughout the year, in most years.
- Non-perennial—does not flow continuously throughout the year, although pools may persist.
- Unknown—for rivers where the flow type is not known.

Non-perennial sub-types (Level 5B)

- Seasonal—with water flowing for extended periods during the wet season/s (generally between 3 to 9 months duration) but not during the rest of the year.
- Intermittent—water flows for a relatively short time of less than one season's duration (i.e. less than approximately 3 months), at intervals varying from less than a year to several years.
- Unknown—for rivers where it is not known whether a non-perennial system is seasonal or intermittent.

Level 6: Characteristics

State whether the wetland is natural or artificial (man-made).

2.3 **Habitat & Ecological Investigation**

2.3.1 **Wetland health assessment**

The WET-Health (Macfarlane et al. 2009) methodology is used to evaluate the integrity and the present ecological state of wetlands. This is a modular based approach for evaluating and monitoring the Present Ecological State (health) of a wetland and its trajectory of change and was specifically designed for the evaluation of all types of wetlands. It considers the key interacting processes that take place within a wetland and synthesize this information by evaluating three inter-related components of health (Hydrology, geomorphology and vegetation). The approach is as follows:

- The extent of impact is measured as the proportion of a wetland and/or its catchment that is affected by an activity. Extent is expressed as a percentage.
- The intensity of impact is estimated by evaluating the degree of alteration that results from a given activity.
- The magnitude of impact for individual activities is the product of extent and intensity.
- The magnitude of individual activities in each HGM unit is combined in a structured and transparent way to calculate the overall impact of all activities that affect hydrological, geomorphological or vegetation health. Present State health categories, on an impact score scale of 1-6 (or health category A-F), are as

follows: natural, largely natural, moderately modified, largely modified, extensively modified, and critically modified (Table 1.1).

- Using a combination of threat and/or vulnerability, an assessment is also made in each module on the likely *Trajectory of Change* within the wetland.

Table 1.1 Impact scores and categories of Present State used by WET-Health

Impact Category	**DESCRIPTION**	**Impact Score**	**PES** Category
None	Unmodified, natural.	0-0.9	A
Small	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	B
Moderate	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9	C
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D
Serious	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	E
Critical	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	F

2.3.2 **Ecological importance and sensitivity (EIS)**

The ecological importance of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales (DWAF, 1999). While the ecological sensitivity refers to a system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (DWAF, 1999). The ecological importance and sensitivity (EIS) can be calculated according to the relevant determinants. The sensitivity is determined on a descriptive scale from Very Low to Very High.

2.3.3 **Watercourse functions**

The current (pre-development) and post-development value of the affected wetland units was determined using the WET-EcoServices tool developed by Kotze et al. (2009). Functions of the HGM Units were rated according to the numerical scale include with Table 1.1.

2.4 **Impact Assessment and Risk Matrix**

2.4.1 **Impact Assessment**

The following method of assessment of potential impacts is used:

- The *nature* of the impact entails a description of the cause of the impact, what will be affected and how it will be affected;
- The *extent* refers to the area where the impact will be significant e.g. on site, local area, regional, provincial, national or international;
- The *duration* refers to the lifetime of the impact:
    - Short term: 0-5 years
    - Medium term: 5-15 years

    - Long term: >15 years
    - Permanent
- The *probability* describes the likelihood of the impact occurring during the duration:
    - Improbable (Low likelihood)
    - Probable (Distinct possibility)
    - Highly Probable (Most likely)
    - Definite (Impact to occur regardless of any preventative measures)
- The significance is determined by analyzing the above subjects and is categorized as low, medium or high. A significance category is applied before mitigation and after mitigation in order to understand the severity of the impact.

2.4.2 **Risk Matrix**

The assessment is based on DWS 2015 publication: Section 21 (c) and (i) water use Risk Assessment Protocol. This matrix was formulated around the following aspects:

1) Consider both construction and operational phases of proposed activities;
2) Consider risks to resource quality post mitigation considering mitigation measures listed in tables provided;
3) Consider the sensitivity (ecological importance and sensitivity - EIS) and status (present ecological status - PES) of the watercourse as receptor of risks posed;
4) Consider positive impacts / risks reduction as a very low risk in this assessment;
5) Indicate confidence level of scores provided in the last column as a percentage from 0 - 100 %;

Only Low risk activities located within the regulated area of the watercourse will qualify for a General Authorization (GA). Medium and High risk activities will require a Section 21 (c) and (i) water use licensing. The Risk Matrix calculates a Low Risk class which implies that a GA for the water uses will be appropriate. This is affirmed by Appendix D2 of Government Notice 509 (2016) pertaining the General Authorization in terms of Section 39 of the NWA (1998) for water uses as defined in section 21c or section 21i which recommends that *all maintenance of bridges over rivers, streams and wetlands and new construction of bridges done according to the SANRAL Drainage Manual or similar norms and standards* that comply with the conditions of Notice 509 are generally authorized.

2.5 **Buffer zone**

The Water Research Commission report: *Buffer zone guidelines for wetlands, rivers and estuaries* (Macfarlane & Bredin, 2017) were used to aid in watercourse classification and determining the need and extent of buffer zones. These publications use the following definitions:

- Buffer zone: *A strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another.*
- Aquatic impact buffer zone:

A zone of vegetated land designed and managed so that sediment and pollutant transport carried from source areas via diffuse surface runoff is reduced to acceptable levels.

According to this guideline, buffer widths should be tailored according to risk: This criterion recognizes the importance of using risk as a basis for establishing an appropriate buffer width. Where risk or uncertainty is high, ecologically conservative buffers should be established whereas less conservative buffers are appropriate for low-risk situations. A number of key risk factors have been identified for possible inclusion in the approach. These include:

(i) Risks posed by adjacent land-uses or activities;
(ii) The importance and sensitivity of the water resource;
(iii) The conservation status (risk of extinction) of aquatic and semi-aquatic species;
(iv) Characteristics of the buffer that affects the functionality of the buffer; and
(v) Mitigation measures that may be applied to reduce risks.

The extent of the buffer zone is calculated from:

(i) Edge of the active channel (Rivers and streams);
(ii) Edge of the temporary zone (Wetlands).

This method of calculating the extent of the buffer is designed for site-based assessments and includes a more detailed evaluation of risks and consideration of site-specific factors that can affect buffer requirements. Such an approach is designed to inform any detailed development planning and provide an appropriate level of information for authorization purposes. In short the following stepwise methodology is applied (Table 1.2):

Table 1.2 Stepwise tasks for buffer recommendation

Step	Task	Scope
1	Define objectives and scope to determine the most appropriate level of assessment	**Desktop assessment:** This assessment is designed to characterize risks at a desktop level in order to red-flag land located adjacent to water resources that should potentially be set aside and managed to limit impacts on water resources. **Site-based assessment:** This assessment is designed for site-based assessments and includes a more detailed evaluation of risks and consideration of site-specific factors that can affect buffer requirements.
2	Map and categorize water resources	The assessor is required to generate a map delineating the boundaries of the water resources potentially affected by proposed developments within the study area.
2.1	Classify the watercourse	E.g. Wetland, spring or river and subcategories: Ephemeral drainage line and type of channel (albeit with or without active channel).
2.2	Map the line from which aquatic impact buffer zones will be delineated (Edge of active channel)	• Rivers and streams – the outer edge of the active channel; • Wetlands – the edge of the temporary zone.
2.3	Identify water resource type	Desktop: Level 3: Sub-system / landscape unit.

		Site based: Level 4: Hydromorphic unit.
3	Management objectives	Use appropriate references and methods (below) to formulate management objectives for the watercourse.
3.1	Determine the Present Ecological State	Desktop or site based assessment depending on requirements from regulating authority.
3.2	Determine the Importance and sensitivity	In order to determine the overall importance and sensitivity of a water resource, the ecological, social and economic importance should be considered.
4	Risk assessment of water resources	Undertake a risk assessment to assess the potential impacts of planned activities on water resources.
5	Risk assessment for protection of biodiversity	Assess risks posed by proposed development on biodiversity and identify management zones
6	Delineate and demarcate recommended setback requirements	Finalize and delineate setback requirements on a layout plan and in the field. In doing so, it is also important to ensure that setback requirements also cater for a range of other potentially important management, functional and legal requirements.
7	Document management measures necessary to maintain the effectiveness of setback areas	Key aspects of the setback requirements will include: • An aquatic impact buffer zone; • Possible core habitat requirements; • Possible corridor requirements; • Any additional aspects requiring consideration to ensure effective management of setback areas.

3. Background Information

3.1 **Biophysical description of the study area**

The study area is located within quaternary degree grid 2431AC, within the Inkomati-Usuthu Catchment Management Area (Primary Catchment X), and more specifically within quaternary catchment X32G (Sand River). According to the River Health Programme (WRC, 2001), the site is located in the *Lowveld Ecoregion* (3).

The natural environment larger study area can be described as the transitional ecotone zone from savanna to grassland on the foothills of the northeastern escarpment. The most serious transformation of the natural environment is as result of formal and informal residential settlements, infrastructure and informal agriculture. The general geology of the area consists of granite and gneiss and soils derived thereof. A typical Lowveld climate prevails with seasonal summer-rainfall, warm temperatures and dry winters. Frost is infrequent.

3.2 **Ecosystems & conservation status**

Nationally, the vegetation type is classified as the Lowveld (A10) according to Acocks (1987) or Mixed Lowveld Bushveld (LR 19) according to Low & Rebelo (1996). On a regional scale the veld unit is classified as *Granite Lowveld* (SVI 3) according to Mucina & Rutherford (2006). *Granite Lowveld* is reasonably well protected (17% in the Kruger National Park and another 17% in adjacent conservation areas). More than 20% has been transformed as result of cultivation and settlement. This ecosystem is rated as *Vulnerable* (Mucina & Rutherford, 2006).

i) ***Mpumalanga Biodiversity Sector Plan*** (MTPA, 2014)

The Mpumalanga Biodiversity Sector Plan (MBSP) is a systematic conservation plan developed and adopted by the Province (DARDLEA) in order to aid in environmental and conservation planning of the province. The categories relevant to this project are projected in Appendix 2 and listed in Table 1.2.

Table 1.2 MBCP and NFEPA categories relevant to the site

Freshwater ecosystems / NFEPA inventory		
Category	**Subcategory**	**Content**
Ecological Support Area	Important sub catchments	ESA: Fish support areas
Terrestrial Ecology		
Category	**Subcategory**	**Content**
Critical Biodiversity Area	Irreplaceable	
Ecological Support Area	ESA Protected Area buffer	
Ecological Support Area	ESA Local corridor	
Other Natural Areas	Other Natural Areas	
Heavily or moderately modified	Heavily modified	Heavily modified
Heavily or moderately modified	Moderately modified	Old lands
Land Cover 2010		
Cultivated		1.5Ha area

ii) ***National Freshwater Ecosystem Priority Areas*** (NFEPA); (WRC, 2011): This application indicates whether priority wetland areas are affected by the proposed activity. The classification for these wetlands are determined using the NFEPA Technical Report and GIS metadata application (WRC, 2011) in combination with the Classification *system for wetlands and other aquatic ecosystems in South Africa* (SANBI, 2013). This application indicates that there are no priority wetlands on or near to the site. The Sand River further to the north is listed as a priority wetland.

Management objective for wetland FEPAs: Wetlands FEPAs that are in a good condition (equivalent to an A or B ecological category) should remain so. Wetlands FEPAs that are not in a good condition should be rehabilitated to their best attainable ecological condition. This means that:

- Land-use practices or activities that will lead to deterioration in the current condition of a wetland FEPA are not acceptable.
- Land-use practices or activities that will make rehabilitation of a wetland FEPA difficult or impossible are not acceptable.

4. Results

4.1 Site and activity description

The property is approximately 88.41Ha in size and is more or less rectangular in shape and shaped along a north – east to south –west axis. The property is located immediately to the south of the village called Dumphries in the extreme eastern side of the Local Municipality. The area is subject to tribal traditions and rural activities consisting of small cultivated lands and rearing of cattle is practiced. The Sabi-Sand Private Nature Reserve is located a short distance to the east. Informal settlements are encroaching into the natural environment on the edge of the village. There are no rocky outcrops present on site, potential wetland zones are present and were investigated. The biophysical features and habitat delineation of the study sites are projected on an aerial image (Figure. 1). Illustrations of the environment and vegetation are included with the following sections.

4.2 Freshwater ecology and wetland integrity

4.2.1 Watercourse classification and delineation

Small wetland units are located on the higher lying areas and drains towards a drainage basi in the central western section. The wetland classification is presented in Table 2.1 and the delineation projected on an aerial image (Figure. 1).

Table 2.1 Wetland classification and attributes

Reference	**Classification and attributes**						
Map reference	Level 1 (Ecoregion)	Level 2 (Wetland vegetation group)	Level 3 (Landscape unit)	Level 4 (Hydrogeo-morphic unit)	Level 5 (Hydrological regime)	Level 6 (State)	NFEPA: Wetland Condition
HGM Unit 1	Lowveld	Lowveld Group 3	Slope	Flat / Seep	Non-perennial Seasonal	Natural	-

4.2.2 Habitat Integrity and Present Ecological State (PES)

i) **Desktop Assessment:**

Available data obtained from the DWS (2014) Desktop Assessment per Sub Quaternary Reach is summarized in Table 2.2.

Table 2.2 Desktop analysis for the sub quaternary catchment

Sub quaternary catchment: X32G-00565: Sand River			
PES Impact category	**Ecological importance (EI)**	**Ecological sensitivity (ES)**	**Ecological category (EC)**
C	High	High	B

ii) **Site Assessment:**

Seasonal flat and seepage wetlands

The topography of the site relatively flat but slopes towards the main drainage line to the west of the site. The slope is gentle and becomes steeper to the west where a drainage basin is formed on an east –west axis. As result of the flat topography on the central section, seasonal flat wetlands are formed in this area when periods of heavy rain are experienced. The wet conditions may continue for a prolonged period of time depending on soil saturation and the depth of the water table. Subsurface flow is directed in this direction when the soil is saturated during and after the rainy season. It is suspected that a shallow hard subsurface horizon is present, creating a perched water table that comes to the surface in places as seepage flow as the predominantly sandy soil is ideal for the formation of seepage wetlands.

Dark grey sandy soil (left) and FeO colouring (right) of the soil at seep zones is clear indicators of wetland conditions

Seepage water and flat wetland next to the main road in the northern section

Flow is seasonal and the wetland surface may dry out during the dry season. These wetlands do not form a single large observable unit but comes to the surface as numerous sub-units of different sizes that can be termed as wetland clusters. The soil samples confirm wetland conditions (wet, grey clayey soil). During the dry

season the soil on the surface is bleached white by the sun and is readily observable on aerial images (Figure 1.).

Vegetation indicators include hygrophilous grasses and sedges. The grass *Sporobolus africanus* is the dominant wetland indicator, other grasses present are *Digitaria eriantha, Eragrostis micrantha* and *Panicum schinzii*. Several species of Cyperacea are indicators of wet conditions.

These wetlands are seasonal and terrestrial vegetation is present close to the wetland units

The wetlands form part of a larger drainage basin situated in the valley bottom central to the wetlands. Two ephemeral drainage lines flow from this basin towards the north and west. This area is typified by scattered large trees of the species *Sclerocarya birrea* and *Diospyros mespiliformis.* Bush encroachment by large stands of *Dichrostachys cinerea* is evident in this area, probably as result of a combination of the removal of trees and overgrazing. Terrestrial vegetation is present on the edges and in-between the wetland pockets, making it quite difficult to delineate each and every pocket as there are numerous pockets of various sizes. For this reason the delineation is based on the aerial image used where the wetland soil is clearly discernible from the terrestrial soil.

Negative impacts are mainly the loss of indigenous vegetation and the cultivation of crops in the wetlands

The main PES components are summarized in Table 2.3

Table 2.3 PES components

PES components
Flow is largely natural. Seasonal or temporary flow.
Geomorphology is largely natural but surface area has been modified for the cultivation of land and construction of informal settlements.
Water quality is largely natural and may be slightly modified by agriculture activities. Sedimentation is not present.
Biota: **Vegetation** has been modified in places as result of vegetation removal for the cultivation of land and encroaching informal settlements. **Fauna** is assumed to be largely modified as result of all the impacts in the local catchment. The wetland is seasonal in nature and not important to aquatic fauna. However, it is important for the maintenance of amphibian fauna as well as Red Data Listed wetland specific species (Marsh Rat and Swamp Musk Shrew).

iii) **WET- Health Assessment**

A Level 1 assessment was used to evaluate the integrity and the present ecological state of the wetlands as it evaluates the general and readily-observable perceived impacts on a specific watercourse segment in the field. The assessment sheets are provided in Appendix 2. The overall PES for the combined wetland units is calculated as a category B = Largely natural category (Table 2.3). Referring back to Table 1.1 this means that the wetlands are: *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.* The trend is negative and encroaching informal settlements and loss of vegetation is a serious concern at present.

Table 2.3 Summary of the overall health of the wetland based on impact score and change score

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
1	10	100	1,0	0	0,3	-2	3,6	-1
Area weighted impact scores*			**1,0**	**0,0**	**0,3**	**-2,0**	**3,6**	**-1,0**
PES Category			**B**	**→**	**A**	**↓↓**	**C**	**↓**

Users are not encouraged to aggregate the scores for the three components of hydrology, geomorphology and vegetation. However, if a user has a specific requirement to do so, then this is based on the following formula: ((Hydrology score) x 3 + (geomorphology score) x 2 + (Vegetation score) x 2) ÷ 7, which gives a score ranging from 0 (pristine) to 10 (critically impacted in all respects). The rationale for this is that hydrology is considered to have the greatest contribution to health.

The overall PES score is calculated using the abovementioned method:

Impact Score	1.5	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.
PES Category	B	

4.2.3 **Wetland ecological importance and sensitivity (EIS)**

The EIS of the wetland is calculated to be *Moderate* (Table 2.2) and discussed thereafter.

Table 2.2 Criteria used for ecological sensitivity and importance rating

Determinant	**Score**
Primary Determinants	
1. Rare & endangered species	4
2. Populations of unique species	0
3. Species/taxon richness	2
4. Diversity of habitat types or features	2
5. Migration route/breeding and feeding site for wetland species	2
6. Sensitivity to changes in the natural hydrological regime	4
7. Sensitivity to water quality changes	2
8. Flood storage, energy dissipation & particulate/element removal	3
Modifying Determinants	
9. Protected status	4
10. Ecological integrity	3
Scoring: 0=None; 1=Low; 2=Moderate; 3=High; 4=Very High	**2.6**

Rare and endangered species:

Endangered biota has the potential of being present (Marsh Rat and Swamp Musk Shrew).

Populations of unique species:

None present.

Species/taxon richness

Diversity is relatively low-medium.

Diversity of habitat types or features:

Medium. Wetland pockets, terrestrial woodland and riparian features.

Migration route/breeding and feeding site for wetland species

The wetland is relatively small and fragmented and not seen as an important corridor for aquatic and wetland biota.

Sensitivity to changes in the natural hydrological regime

Sensitivity to flow is considered to be high. Presently, the hydrology is largely natural.

Sensitivity to changes in water quality

The water quality is natural and sensitive to change.

Flood storage, energy dissipation & particulate/element removal

The wetland is important for erosion control

.

Protected status

The wetland is not listed as a NFEPA.

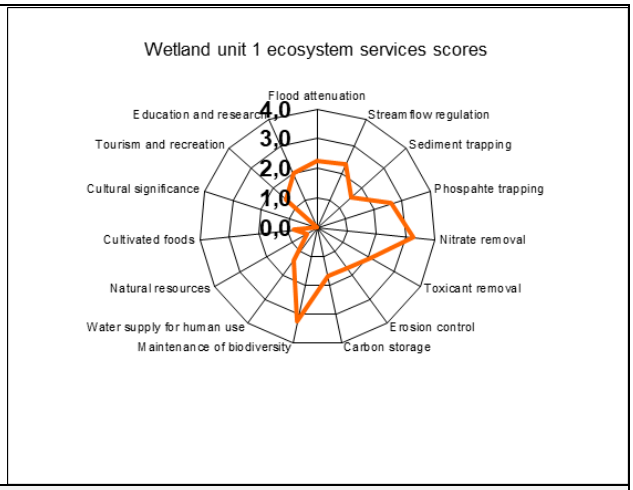
Ecological integrity

The ecological integrity is rated as high and this is supported by the PES calculated as class B: Largely natural.

4.2.4 **Watercourse functions**

A Wet-Ecoservice evaluation was done for the wetlands to determine the functions and services provided by the wetland. The results are presented in Table 2.4 and explained in the text thereafter.

Table 2.4 Wetland functions summary

Condensed summary sheet		
Size	Ha		
Score	Overall score	Confidence rating	
Flood attenuation	2,3	3,1	
Stream flow regulation	2,3	3,2	
Sediment trapping	1,5	3,2	
Phosphate trapping	2,6	2,7	
Nitrate removal	3,3	2,7	
Toxicant removal	2,1	2,8	
Erosion control	1,7	2,7	
Carbon storage	1,7	2,7	
Maintenance of biodiversity	3,3	3,8	
Water supply for human use	1,4	3,4	
Natural resources	0,4	3,8	
Cultivated foods	0,8	4,0	
Cultural significance	0,0	4,0	
Tourism and recreation	1,4	4,0	
Education and research	2,0	3,8	
Threats	1,0	4,0	
Opportunities	3,0	3,0	

4.2.5 **Sensitive environments in proximity of the project**

There are no NFEPA listed wetlands located within 1km of the site.

4.2.6 **Impact Assessment and Risk Matrix**

4.2.6.1 **Impact Assessment**

The proponent wishes to transform the land near to the wetland zones for residential development. The MTPA land use principles and the NFEPA guidelines for this type of wetland are as follows:

MTPA land use guidelines for CBA wetlands are:

- If the current ecological condition is good (either natural and unmodified, or largely natural with only small change in habitats and biota), then this condition needs to be maintained.
- If the current ecological condition is fair to poor (i.e. moderately to severely degraded with significant loss of natural habitat, biota and ecosystem functions), then this needs to be improved through rehabilitation measures.
- Refer to the NFEPA Implementation Manual for specific guidelines (for example, mining should not take place within 1 km of the boundary of the buffer around a wetland).
- Note that the generic buffer is 100m measured from the outside edge of the wetland.

NFEPA guidelines for priority wetlands are:

Wetlands FEPAs that are in a good condition (equivalent to an A or B ecological category) should remain so. Wetlands FEPAs that are not in a good condition should be rehabilitated to their best attainable ecological condition. This means that:

- Land-use practices or activities that will lead to deterioration in the current condition of a wetland FEPA are not acceptable.
- Land-use practices or activities that will make rehabilitation of a wetland FEPA difficult or impossible are not acceptable.

The abovementioned guidelines suggest that the wetlands should be conserved and a 100m buffer must be applied or an alternative buffer must be calculated using the DWS tool. These requirements can be met by this application as the wetlands will be conserved. A buffer will be applied (as calculated in section 4.2.7).

The wetland is subject to several historic and present impacts (Table 2.2). The proposed activity implies that the wetlands will not be disturbed. The main aspects that are considered in the impact assessment (taking into account that the wetland zones will be conserved):

Wetland surface area and habitat:

No vegetation clearing will take place within the wetlands and no surface area will be lost. A buffer is proposed as mitigation to any negative consequences related to the activity. Impact significance after mitigation is rated as low.

Loss of vegetation and fragmentation of habitat:

i) Consequence of vegetation clearing nearby the wetland

No vegetation clearing will take place within the wetlands. A buffer is proposed as mitigation to any negative consequences related to the activity. Additional mitigation is alien invasive vegetation control to prevent fragmentation of habitat. Impact significance after mitigation is rated as low.

ii) Consequence of proposed activities within the wetland

The proposed activities within the wetland zone must be limited to road crossings and pipeline crossings if necessary. These tasks must be done with care and physical disturbance must be limited to the absolute minimum. As mitigation, these activities must be performed during the dry season when flow is at its lowest in order to prevent erosion and sedimentation. Complete rehabilitation of disturbed areas must take place. Negative impact duration will be short term and significance after mitigation is rated as low.

Loss of biodiversity:

No biodiversity will be lost within the wetlands. A buffer is proposed as mitigation to any negative consequences related to the activity. Additional mitigation is alien invasive vegetation control to prevent the oppression of indigenous biota. Impact significance after mitigation is rated as low.

Loss of threatened and rare biota:

The endangered biota that has the potential to be present within and on the fringes of the wetlands will not be directly affected. A 20m buffer is proposed as mitigation to any negative consequences related to the activity. Additional mitigation is the protection offered by security measures to prevent theft and vandalism of rare biota. Impact significance after mitigation is rated as low.

Wetland morphology:

i) Consequence of vegetation clearing nearby the wetland

The wetland morphology will not be modified for the purpose of residential development. Clearing of vegetation nearby the wetland of the proposed development land may result in soil erosion and subsequently siltation (sedimentation) of the wetlands. Mitigation is included under the following heading (increased surface flow). Furthermore, these activities must be performed during the dry season when flow is at its lowest in order to prevent erosion and sedimentation. Complete rehabilitation of disturbed areas must take place.

ii) Consequence of proposed activities within the wetland

The proposed activities within the wetland zone must be limited to road crossings and pipeline crossings if necessary. These tasks must be done with care and physical disturbance to the morphology must be limited to the absolute minimum. As mitigation, these activities must be performed during the dry season when flow is at its lowest in order to prevent erosion and sedimentation. Complete rehabilitation of disturbed areas must take place. Negative impact duration will be short term and significance after mitigation is rated as low.

Wetland hydrology:
The removal of vegetation in the wetland sub catchment will result in increased surface water run-off entering the wetlands as the central drainage basin and wetland provides a natural drainage feature for conveying surface water run-off. The operational phase is not expected to be problematic as the drainage basin has a gentle slope, a wide surface area across which the water can disperse and it does not have defined channel into which water will concentrate and cause erosion. Surface run-off that does occur must be conveyed to the buffer zone via swales (shallow grass-lined channels with flat and sloped sides that are used to convey storm water from one place to another. They typically remain dry between rainfall events). One of the objectives of the proposed buffer is to ensure that surface run-off water can be discharged onto the buffer and be allowed to disperse before entering the wetland zone. Points of storm water discharge must be designed not concentrate the flow of water but to disperse the water over a wide area. Road crossings must be designed with the objective not to impede or divert flow. No construction rubble and spoil material may be disposed of or stored in the wetland zones or the buffer zone.

Wetland water quality:
Water quality may be affected by the following aspects:

- Sediment (erosion on nearby land and roads)
- Leaking sewers.
- Litter and domestic waste.

Cumulative impacts
Wetlands in the larger study area is under pressure from the cumulative impacts arising from agriculture, residential development and more seriously, illegal sand mining. In the above-mentioned sections potential impacts have been discussed and assessed. By consideration of alternatives, planning and mitigation measures the cumulative impacts of this development will minimize the negative consequences on the integrity of the wetlands on site and further downstream. The cumulative impact magnitude and significance is low.

4.2.6.1 **Risk Matrix**

General Notice 509 of 2016 indicates that any Section 21(c) or 21(i) Water Use Activities, as listed in the National Water Act, 1998 (Act No. 36 of 1998) within the regulated areas of a watercourse where the risk class is considered to be Low, can be Generally Authorised (GA). Any activities that score a Medium or High Risk Class must undergo a Water Use License Application (WULA). The following scoring is applicable to the outcomes of a Risk Assessment Matrix. A ***Low*** Risk Class is calculated, suggesting that a General Authorisation for the water use is applicable.

4.2.7 **Aquatic buffer zone and additional mitigation**

The MTPA minimum requirement is a 100m buffer zone around NFEPA wetlands and rivers. This requirement may be applicable in cases to protect pristine ecosystems but in this instance it will sterilize a large surface area of land available for cultivation in an already disturbed ecosystem. The MTPA handbook suggests that

the DWS tool for buffer zones can be used to calculate an effective buffer instead of applying the generic 100m buffer zone.

The DWS tool (The Water Research Commission report: *Buffer zone guidelines for wetlands, rivers and estuaries* (Macfarlane & Bredin, 2017)) were therefore applied to aid in watercourse classification and determining the need and extent of aquatic buffer zones. This model considers potential impacts of the proposed activity on the integrity of the freshwater ecosystems and calculates a buffer zone that will be effective to mitigate the consequences of potential impacts. The calculated buffer zone is 20m wide. One exception where the buffer size can be relaxed is where roads and infrastructure are planned to cross the wetlands.

5. Conclusion and Recommendations

The investigation found that the wetlands on site are largely natural - moderately modified (PES= Class B/C) and medium ecological sensitivity and importance. A 20m buffer zone is recommended to protect the wetlands and hydrological features. The ecological functions and overall condition of the wetland can be maintained and improved by simple rehabilitation tasks, maintenance of infrastructure and preventative measures, especially alien invasive vegetation control, erosion control and not allowing illegal sand mining and encroaching informal settlements.

The investigation and assessment concludes that the aquatic ecosystems and wetlands will not be significantly affected by the proposed activities if the appropriate buffer zone and mitigation measures are adhered to. The wetlands and sensitive biota will be protected within a buffered conservation area. Generic mitigation measures will apply with regards to alien invasive vegetation, pollution, erosion/sedimentation and other environmental aspects.

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