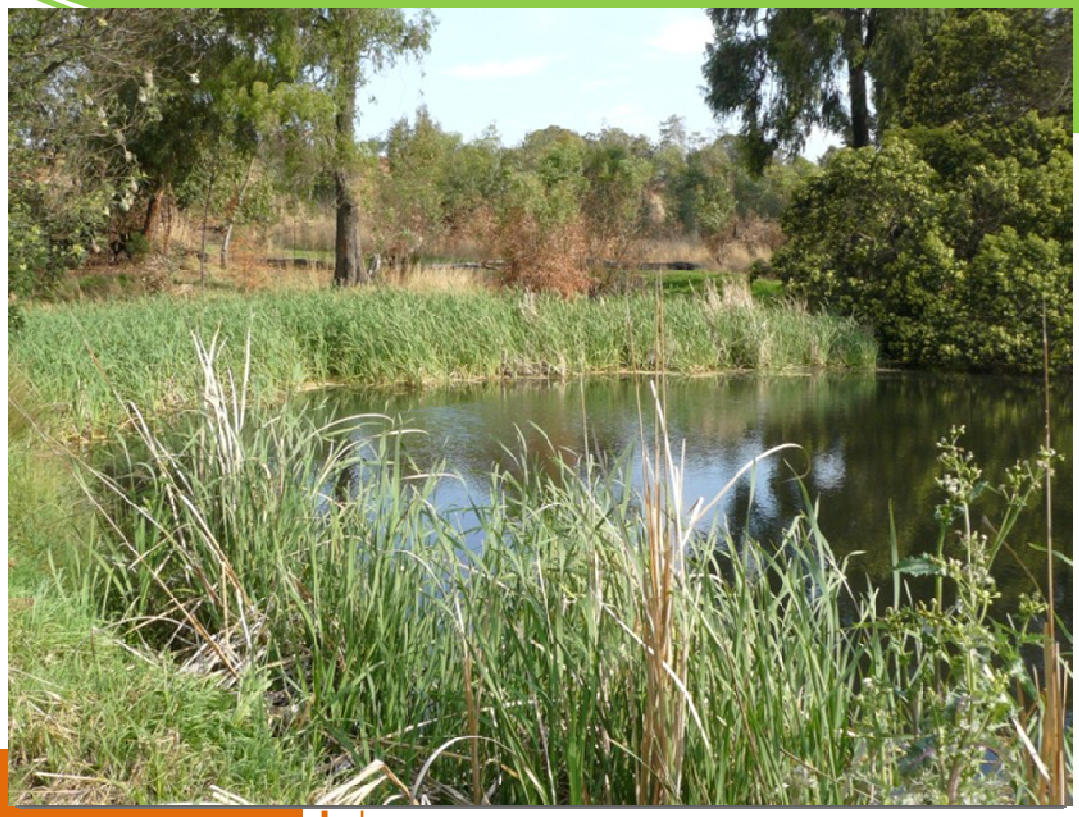
Riparian and wetland delineation -

For the proposed South Hills development project on Erf 1202 South Hills, Portion 65 of the farm Klipriviersberg 106 I.R. and Holding 88 Klipriviersberg Estate, Gauteng.



Compiled by: Werner Marais

Reviewed by: Antoinette Bootsma

& Shaun Taylor

27 October 2009

PREPARED FOR:

Thibane, Strydom & Associates

by

CK 2009/057469/23

P.O. Box 6892
Weltevredenpark
Gauteng
1715
☎ +27 78 190 3316
Fax: 086 560 3055

✉ werner@animalia-consult.co.za

www.animalia-consult.co.za

Our Ref: R-0910-10

Purpose and Scope

To determine the outer boundary of the riparian habitat on Holding 88 Klipriviersberg Estate and partly in Portion 65 of the farm Klipriviersberg 106 I.R.; As well as delineating the outer boundary of the wetland habitat on Erf 1202 South Hills in Gauteng and recommend buffer zones. This report will identify potential impacts of the proposed development on the riparian and wetland habitats recommend mitigation measures. Ultimately, this study aims at contributing to the safeguarding of the biodiversity and ecological roles of the riparian and wetland habitats present on the site.

Appointment of specialist

Animalia Zoological & Ecological Consultation CC was appointed by Thibane, Strydom & Associates to undertake a specialist riparian and wetland delineation study on the site of the proposed development consisting of Holding 88 Klipriviersberg Estate, Portion 65 of the farm Klipriviersberg 106 I.R. and Erf 1202 South Hills in Gauteng. See Appendix B for details on the specialist.

Independence:

Animalia Zoological & Ecological Consultation CC has no connection with the developer. Animalia Zoological & Ecological Consultation CC is not a subsidiary, legally or financially of the developer; remuneration for services by the developer in relation to this proposal is not linked to approval by decision-making authorities responsible for permitting this proposal and the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project.

TABLE OF CONTENTS

1. Introduction

1.1 Study area **5**

1.2 Land use and existing impacts on the site **8**

1.3 Topography, climate and vegetation unit **10**

1.4 The importance of riparian and wetland habitats **11**

2. Methods **13**

3. Results **14**

3.1 Uncertainties, assumptions and limitations in the study **14**

3.2 Flora **15**

3.3 Delineation **16**

4. Effects of the proposed development and proposed mitigations and recommendations **18**

4.1 Destruction of riparian habitat and biodiversity **18**

4.2 Additional rainwater runoff and erosion **18**

4.3 Pollution during construction and beyond **20**

4.4 Alien invasive plants **20**

5. Conclusion **21**

6. References **24**

Appendix A **26**

Appendix B **30**

1. INTRODUCTION

1.1 Study Area

The South Hills development site is in the grid squares 2628AA and 2628AC in Gauteng (figure 1, 2), with the centre point of S 26.250785° and E 28.077614° (decimal degrees). The study site is a total area of approximately 204ha.

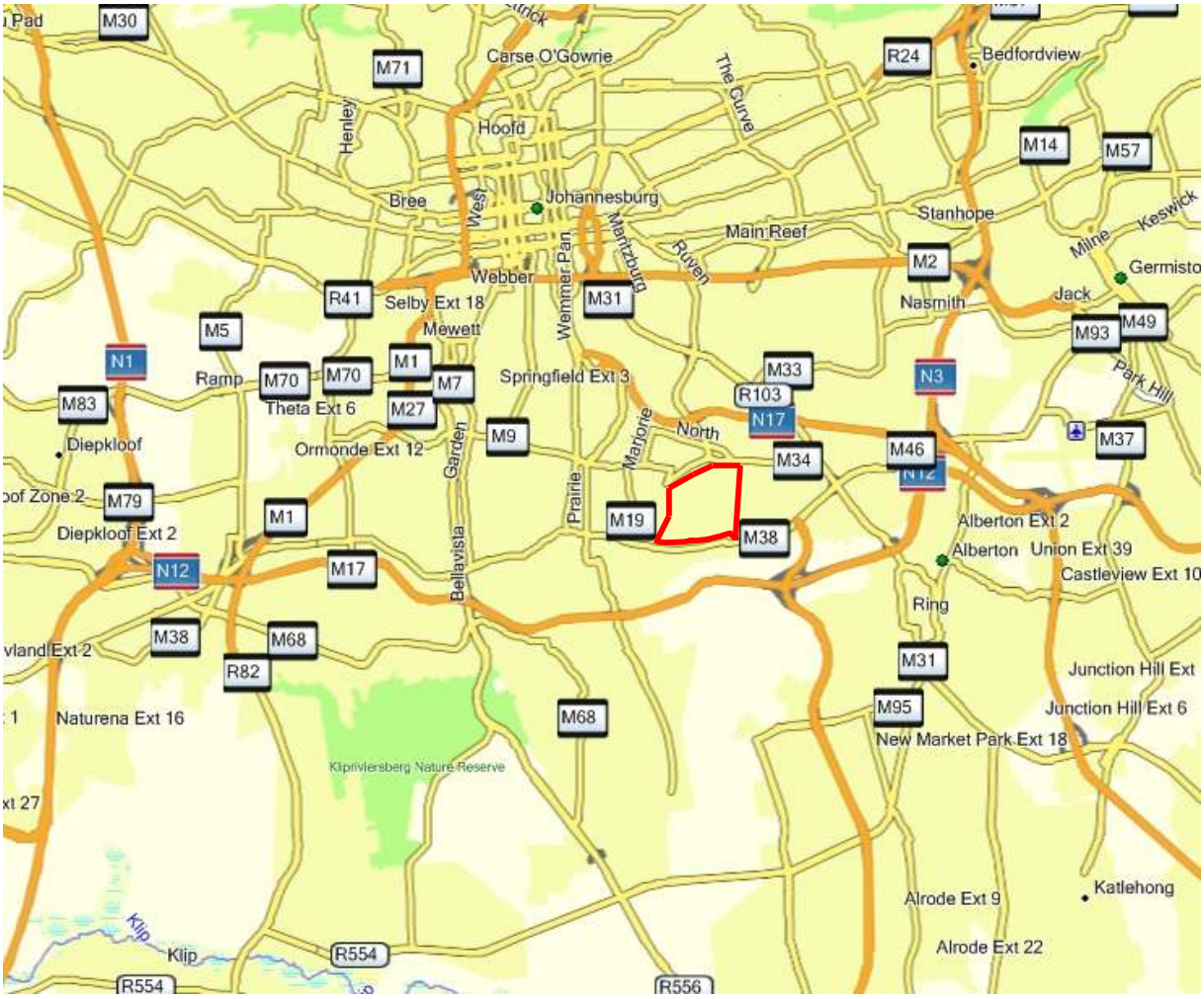


Figure 1: Road map with a rough indication of the proposed site locality (red outline).

Figure 2: Satellite image of the site with boundaries indicated. Note the dense populations of invader vegetation along the watercourse.

According to the desktop survey conducted in October 2009 by Envirokey CC (Refer to Appendix A for a copy) and data obtained from the Gauteng Department of Agriculture, Conservation and Environment (now known as the Gauteng Department of Agriculture and Rural Development - GDARD), the study site is inside the urban edge, which implies a 30 meter buffer zone around any riparian and wetland habitats to protect their functionality (GDACE, 2009).

Figure 3 illustrates features or areas designated under the Conservation Plan (C-plan) for Gauteng (Version 2 updated 2005). A non-perennial river flows directly through the centre of

the site bisecting it to the west and east. Topographically, the site holds a class 2 ridge which stems from the southern border of the site and extends to the centre. More generally, the site contains areas identified as irreplaceable. These areas are deemed irreplaceable due to sensitive bird habitat, sensitive invertebrate species and sensitive plants. On the other hand, abiotic features include the ridge and non-perennial river. Lastly, according to the Gauteng Agricultural Potential Atlas (GAPA) for 2004 the entire site is considered to be of a very low agricultural potential (Envirokey, 2009).

Figure 3: Desktop study map indicating the Class 2 ridge, non-perennial river and location of irreplaceable areas.

1.2 Land use and existing impacts on the site

Current land uses include a fenced off storage facility for domestic and garden refuse, two sports fields, a carwash, at least 20 shelters of squatters and open natural space.

Levels of impact on the site vary considerably in different areas of the site. Illegal dumping of building rubble and other waste is severe on Erf 1202 South Hills especially on the north-eastern parts of the Erf, this is due to an access road onto the site in this area. Litter around the waste storage facility is clearly evident and may have been dispersed all over the site by the squatters and windy conditions (figure 4).

Figure 4: Litter dispersed over large areas of the site form the waste storage facility.

From an ecological point of view, certain animals are impacted by poaching pressure from the squatters. This includes any animals of a suitable size such as the Helmeted Guineafowl, small antelope, tortoises, small carnivores, any other birds that may be caught easily.

The watercourse bisecting the site is heavily impacted and dominated by alien invader stands of Black Wattle trees (*Acacia mearnsii*), Bluegum trees (*Eucalyptus* spp.) and species of weeds associated with disturbed soil conditions (figure 5).

Certain areas along this watercourse are eroded to a high degree. The main reason for this may be due to the fact that there is almost no undergrowth in the dense stands of Black Wattle and Bluegum trees which don't have ideal root systems for stabilising topsoil. When cut down (as is the case in some areas on the site), the erosion is increased dramatically (figure 6). Increased stormwater entering the system from the surrounding developments can also potentially worsen the erosion.

Figure 5: (Top) A dense stand of Black Wattle trees; such stands dominated all along the watercourse. Note the bare ground underneath the stand. **Figure 6:** (Below) The heavy erosion found along the watercourse. Erosion on the hill slope along the watercourse, note the cut down invader trees in the area.

1.3 Topography, climate and vegetation unit

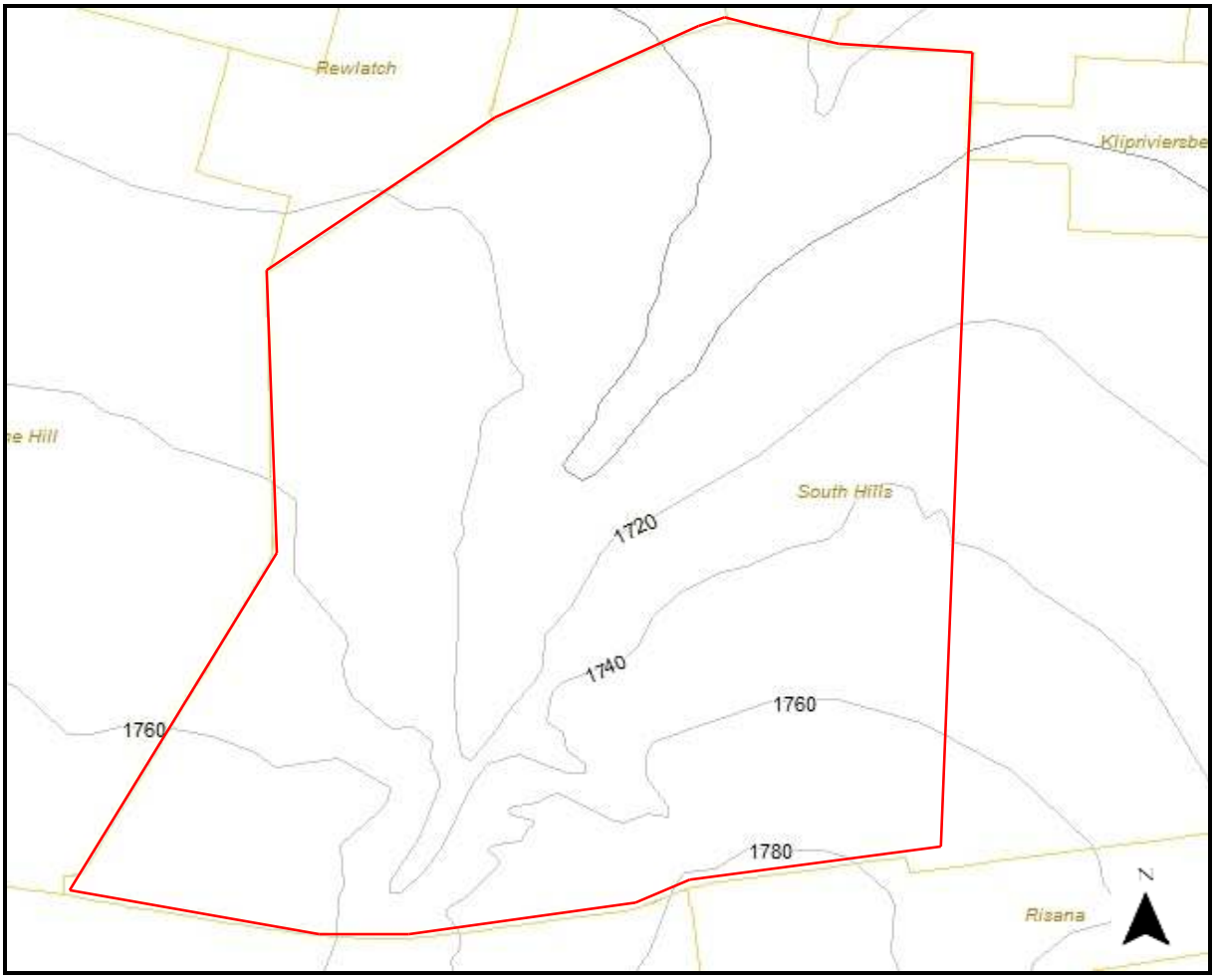


Figure 6: Contour map (20m) indicating the ridges on the southern part of the site and the valley bisecting the site.

According to the hydrological report prepared by WSM Leshika (2009) the topography of the site varies from 1688 meters above sea level in the north, to 1787 in the south. The terrain rises to the south, with the highest point being the southeast corner. The terrain slopes steeply towards a first order stream that runs northwards through the middle of the property. This stream is ephemeral (storm-event driven), except in its lower reach. The property is part of Quaternary catchment C22B, which drains southwards via the Klipspruit, which enter the Vaal river at Vereeniging.

The dominating vegetation type of the broader area and the northern parts of the site is classified as the Soweto Highveld Grassland which is found in Gauteng and Mpumalanga. This bioregion has a Mean Annual Precipitation (MAP) of 662 mm, with large fluctuations between maximum summer and minimum winter temperatures and large diurnal temperature

fluctuations with frequent frost occurrences; typical of a cool-temperate climate (Mucina & Rutherford, 2006).

The landscape is gently undulating on the Highveld plateau. In undisturbed areas only scattered wetlands or rocky outcrops may break the continuous grassland cover of short to medium-high tufted grasses. In general the dominating grass species of the vegetation unit are *Themeda trianda, Elionurus muticus, Eragrostis racemosa, Heteropogon contortus* and *Tristachya leucothrix.* Refer to the relevant vegetation specialist study on more detail regarding vegetation communities.

The conservation status of this vegetation type is currently classified as Endangered, with a target of 24% to be conserved of which only 0.2% is formally conserved in reserves, with only 52.7% still remaining (Mucina & Rutherford, 2006).

The vegetation unit of the southern ridge part of the site is classified as Andesite Mountain Bushveld forming part of the greater Savanna biome. Currently this vegetation unit is classified as Least Threatened and 85% are unmodified with 6.8% formally protected in reserves. But biodiversity are usually high in such rocky habitats (Mucina & Rutherford, 2006).

1.4 The importance of riparian and wetland habitats

A riparian habitat (as defined by the National Water Act):

"*Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized 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 land areas.*"

Riparian habitats are usually characterized by more vigorous growth of trees and shrubs that may remain productive and green during dry winter months. The dense vegetative cover over the stream and the high ecological energy value of these habitats make them essential to the healthy functioning of broader ecosystems and biodiversity. Some important functions of the riparian habitat include:

- Store water and help reduce floods;
- stabilize stream banks;
- improve water quality by trapping sediment and nutrients;
- maintain natural water temperature for aquatic species;
- provide shelter and food for birds and other animals;
- provide corridors for movement and migration of different species;

• can act as a buffer between aquatic ecosystems and adjacent land uses;
• can be used for recreational and educative purposes (DWAF, 2005).

A wetland (as defined by the National Water Act) is any:

"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."

The most important factor that determines the species composition and productivity of a wetland is the hydroperiod, which is the frequency of water saturation. This determines the type of habitat and fertility of soils, and creates unique ecosystems that many species depend on or have co-evolved with. Although wetlands cover only 2% of Earth's surface, they are estimated to contain 10 – 14% of the carbon; and some soils like histosols, which may contain up to 20% carbon by weight. Proportionally they act as carbon sinks partially relieving the global CO_2 problem. Also, the aerobic-anaerobic stratification of wetland soils is proportionally important for global cycling of sulfur, nitrogen and phosphorus (Odum & Barret, 2005).

According to DWAF (2005), wetlands have enormous monetary value and make significant direct contributions to national economies and human well-being. The primary rational behind this estimation is the fact that wetlands play an invaluable role in processing water and regulating runoff. Water of improved quality and sufficient quantities is vital for the economy and wealth of South Africa. Wetlands delay the flow of water during rainy seasons, preventing excessive flooding and release the water during dry seasons when it is scarce. Additionally they filter water by trapping toxins and heavy metals in sediments, and neutralise organic pollution and disease organisms to a certain extent, thereby offering a valuable natural service to urban populations.

A wide scope of biodiversity is present in wetlands, occurring only in such specific habitats which would be very costly to simulate.

2. Methods

The delineation of the riparian habitat was done according to the recommendations outlined by the DWAF practical field procedure for the identification and delineation of wetlands and riparian areas (2005) as the governing guideline. The study was done on 13th and 14th of October 2009. Whilst delineating the riparian habitat three indicators were taken into account: Topography and landform, vegetation, and alluvial soil deposits. The topography and landform was used as the main indicators, with the presence of alluvial deposits being complimentary, since the vegetation was severely altered by invasive species.

A buffer of 30 meters was applied to the outer edge of the riparian habitat, and recorded on a handheld GPS unit. No buffer points were demarcated on the site using physical markers. Co-ordinates taken with the GPS unit are to be supplied as a GIS shapefile accompanying this report. The physical markers may be installed on site before the initial construction phase and earthworks begin if desired, the wetland specialist may also accompany the land surveyor while installing physical markers. The rationale for this developed as a result of theft of the markers in several previous studies.

The wetland delineation (the lowest regions of the watercourse) was done with the recommendations of DWAF (2005) as the governing guideline, and was also done on the 13th and 14th of October 2009. Whilst delineating the wetland area four specific indicators were taken into account: Topography and landform, vegetation, soil form and soil wetness. The soil wetness indicator was predominantly utilized as an indicator of wetlands, with the topography and vegetation complimenting this indicator. With the soil wetness indicator, the soil was examined for signs of hydromorphic characteristics such as mottles. The presence of hydrophilic plants constitutes the vegetative indicator. Mottles are speckles forming in the soil due to prolonged conditions fluctuating between aerobic and anaerobic conditions (fluctuating water saturation).

The outer edge of the temporary zone was used as the edge of the wetland from which a buffer zone of 30 meters was applied. The temporary zone is the area of the wetland that is saturated with water for less than three months per year. The seasonal zone is usually saturated for at least three months a year while the permanent zone maintains wetness all year round (DWAF, 2005). These different zones display different degrees of hydromorphic soils and hydrophilic plants.

3. RESULTS

3.1 Uncertainties, assumptions and limitations in the study

The riparian vegetation was heavily altered because of the presence of invader plant species along most areas of the watercourse. Due to the bare soils and low percentage of ground cover underneath these invaders (especially dense stands of Black Wattles) and the storm-driven ephemeral nature of the watercourse in the southern regions of the site, the levels of erosion was very high along many areas of the watercourse. This made identification of riparian habitat and the macro channel bank challenging, since the edges of the macro channel bank may change rapidly during heavy rains where surface runoff may erode the banks further. Differences in interpretation of current and historic wetland boundaries may exist due to this erosion of the macro channel bank. The wetland delineation at the northern part of the site did not present the same problem because of the lower slope (figure 7).

Figure 7: Example of mottling found whilst delineating the wetland area.

The riparian delineation aimed only at identifying the outer edge of the riparian habitat necessary to support associated biodiversity, and excludes water quality, water flow, silt burden determination, flood line assessments and historical functioning.

The accuracy of a handheld GPS unit is less than the differential GPS units used by land surveyors which are accurate up to a few centimeters.

3.2 Flora

Table 1: Plant species recorded in the wetland and riparian zones.

Plant species	Red data status	Native / Alien
Acacia mearnsii	-	Alien
Acacia sp.		Alien
Bromus catharticus	-	Alien
Chenopodium album	-	Alien
Coleochloa setifera	LC	Native
Conyza podocephala	LC	Native
Cyperus rupestris	LC	Native
Eragrostis curvula	LC	Native
Fuirena pubescens	LC	Native
Hypochaeris radicata	-	Alien
Nemesia fruticans	LC	Native
Pennisetum clandestinum	-	Alien
Plantago lanceolata	LC	Native
Solanum retroflexum	LC	Native
Tagetes minuta	LC	Native
Taraxacum officinale	-	Alien
Trifolium pretense	-	Alien
Typha capensis	LC	Native
Verbena bonariensis	-	Alien

3.3 Delineation

In the delineation map (figure 8) it will be noted that the riparian habitat is demarcated narrower than the vegetation associated with the watercourse visible in the satellite image. This is because the associated vegetation is alien invasive trees (*A. mearnsii* and *Eucalyptus* spp.) that are not confined to the watercourse, and the field observations confirmed that the dense populations expanded higher uphill where no riparian habitat indicators exist.

Figure 8: The riparian and wetland delineation map.

Figure 9: (Top), a section of the wetland area in the lower northern region of the site, and (below) a section of the lower regions of the non-perennial stream where the conditions are not ephemeral anymore.

4. EFFECTS OF THE PROPOSED DEVELOPMENT and PROPOSED MITIGATION MEASURES AND RECOMMENDATIONS

4.1 Destruction of wetland habitat and biodiversity

If the proposed development would be allowed to extent too close to the riparian and wetland habitats it would affect the biodiversity associated with these habitats negatively, if such a habitat is destroyed the high ecological energy value of the wetland habitat would be lost to a wide variety of biodiversity critically depending on it. Downstream habitats and biota may also be significantly impacted by higher silt burdens and increased energy in rapids, altering the microbial and other aquatic faunal structures.

Proposed mitigatory measures or recommendations

The buffer zones indicated in the delineation map (figure 8) must be strictly adhered to, and the areas covered by the buffers be treated as environmentally sensitive. No vehicles, storage of building materials or rubble, activities of workers or any other actions are allowed in the delineated riparian/wetland and buffer zones. A palisade or other fence around the areas designated as sensitive by all the specialist studies must be erected, as this will prevent accidental access into the sensitive areas. The delineation of the riparian/wetland habitats present on the site as well their required buffer zones are provided in the shapefiles accompanying the report. Any impact on the buffer zones is **strictly prohibited**, and if any of these are damaged during the construction phase of the development they **must** be rehabilitated to restore its essential functions.

If electric fences are installed to any boundary wall of the development, it is recommended that small (tennis ball sized) bright coloured plastic markers be attached to the top strand of the electric fence at the side facing the riparian/wetland habitat. This is to prevent water birds, Ibis for example, and other less agile species flying into the electric fence which may be camouflaged in the upward sloping background of the hill slopes.

4.2 Additional rainwater runoff and erosion

Natural seepage through the soils and grassy habitat of the site delays water discharge into the stream. But the proposed development collectively contains large areas of impermeable surfaces like paving and roofs. This will result in an increased runoff of rainwater into the stream, contributing to the already problematic and hazardous “flash floods” occurring in urban

areas after heavy summer rain storms. Erosion levels will increase with more surface runoff to such a level that the physical structures of the development may be under threat in the future. Also, the silt burden in the downstream watercourse will increase and subsequently affect visibility and oxygen consumption by aquatic biota (figure 10).

Figure 10: A section in the lower downstream region of the watercourse showing the prevalent silt burden already present in the water from the upstream erosion. Erosion and silt burdens may be natural in ephemeral systems to a certain extent, but is increased by the upstream invader tree populations not permitting undergrowth.

Proposed mitigatory measures or recommendations

Storm water runoff and subsurface seepage under the development site should be strictly managed and allowed to seep away gradually into the stream. Energy dissipaters in the form of attenuation ponds, gabions, grass blocks or other suitable structures must be installed. Stormwater may not be released directly into the watercourse or the buffer zone as specified in GDACE (2009). A storm water management plan **must** address this problem, with proposed mitigations for the construction as well as operational phases of the development. Such a plan **must** also address the problem of erosion.

4.3 Pollution during construction and beyond

Pollution of the riparian habitat and stream may occur during the construction of the development in the form of oils, rubble, litter, toxins, cement residue etc. This will affect the ecology and functionality of the watercourse. Amphibians are especially susceptible to chemical changes and pollution in their aquatic environment due to their unique skin characteristics (Semlitsch, 2003). Refer to the relevant hydrological report (Sami, 2009) for more information on probable pollution discharges from the proposed development.

Proposed mitigatory measures or recommendations

All waste to be assembled at a given point on the site during construction and regularly removed from site at short intervals. A storm water management plan should be compiled to maintain clean water systems and isolate dirty water bodies generated during construction and/or operation of the development. Effective emergency practices for accidental spillage of hazardous materials should be ready at all times, and entry strictly prohibited into the riparian/wetland areas and their 30m buffer zone.

4.4 Alien invasive plants

This is an already occurring problem on the site and its riparian habitat. The developer is responsible for eradicating the alien invader plants occurring on site and in the riparian habitat. Practical methodologies for the eradication of alien invader plants should be included in a document giving clear guidelines on the process and handed over to the developer and future managing agents. Specific details and environmental issues regarding eradication of the alien invaders should be addressed in a relevant Rehabilitation Plan.

5. CONCLUSION

The demarcated 30 meter buffer zones should be treated as environmentally sensitive throughout all phases of construction and operation of the proposed development (see map figure 8). No vehicles, machinery, storage, structures, construction or landscaping are allowed in the buffer zones. The recommended mitigations in Section 4 should be followed.

Mitigation measures for controlling and addressing the already significant erosion along the watercourse **must** be drafted in a storm water management plan and strictly adhered to.

It is **strongly recommended** that a Rehabilitation Plan be drafted, and incorporated into the relevant Ecological Management Plan to rehabilitate the watercourse and surrounding areas from ongoing deleterious impacts by large communities of alien invader trees and severe erosion.

Werner Marais

Zoologist and Ecologist
MSc (Biodiversity & Conservation, UJ)
Pending Pr.Sci.Nat. – SACNASP (Ecology)

The report has been reviewed for fundamental accuracy by Antoinette Bootsma from Limosella Consulting, as well as by Shaun Taylor and Sharon Meyer of Envirokey.

Antoinette completed a BSc (Hons) degree in Botany at the University of Pretoria. She is an active member of the Gauteng Wetland Forum through her participation in the Wetlands Database Subcommittee. She was nominated to form part of a National Wetland Forum Steering Committee which aims to develop criteria for membership to a national Wetland Practitioners Professional Society. She has also provided input into the Minimum Requirements for Biodiversity Studies in Gauteng Version 2. Antoinette is further nominated as a member of the committee of the Botanical Society, Pretoria Branch with a portfolio in conservation. Antoinette is a candidate member of the Council for Scientific Professionals SACNASP # 100029-08 under the mentorship of Prof. George Bredenkamp DSc MSAIE&ES Pr.Sci.Nat.

Shaun has a BA degree in Geography and Environmental Science. He is currently undertaking a BSc (Hons) degree including river and wetland ecology, environmental management, conservation biogeography and advanced Geographic Information Systems in his studies. He has also completed the Wetland Delineation and Rehabilitation Training Course from the School

of Continuing Education, University of Pretoria and he has undertaken short courses in The Introduction to the Principles of Identifying of Wetland Plants and Veld Management.

Sharon Meyer is an environmental consultant with 9 years experience. Ms Meyer has attended the GDACE wetland course at Pretoria University. She has an MSc in Zoology and is SACNASP registered as a professional natural scientist (*Pr. Sci. Nat*.).

Reviewed and signed off by:

Antoinette Bootsma

Shaun Taylor

Sharon Meyer

6. REFERENCES

i) CARRUTHERS V. 2007. *Specialist wetland assessment and delineation at proposed site for Eskom Mercury Substation*. VC Management Services CC.

ii) DWAF - DEPARTMENT OF WATER AFFAIRS AND FORESTRY. 2005. *A practical field procedure for identification and delineation of wetlands and riparian areas*. Johannesburg.

iii) Envirokey. October 2009. *Desktop study for Portion 65 of the Farm Klipriviersberg 106 IR.*

iv) GAUTENG DEPARTMENT OF AGRICULTURE, CONSERVATION AND ENVIRONMENT: DIRECTORATE OF NATURE CONSERVATION. March 2009. *Requirements for Biodiversity Assessments*. GDACE, Johannesburg.

v) IGS (Institute for Groundwater Studies). 2007. *Groundwater Dictionary*. University of the Free State. South Africa.

vi) MUCINA L & RUTHERFORD MC. 2006. *The vegetation of South Africa, Lesotho and Swaziland.* South African National Biodiversity Institute (SANBI). Pretoria.

vii) NATIONAL WATER ACT. 1998. Government Gazette, 19182. Act 36, 26 August 1998. Pretoria, South Africa.

viii) ODUM EP & BARRETT GW. 2005. *Fundamentals of ecology*. Thomson Brooks/Cole.

ix) SAMI K. September 2009. *South Hills geohydrological report.* WSM Leshika Consulting (Pty) Ltd.

x) SEMLITSCH RD. 2003. *Amphibian Conservation*. Smithsonian Books.

DISCLAIMER

The services carried out and reported in this document have been done as accurately and scientifically as allowed by the resources and knowledge available to Animalia Zoological & Ecological Consultation CC at the time on which the requested services were provided to the client. Animalia Zoological & Ecological Consultation CC reserves the right to modify aspects of the document including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although great care and pride have been taken to carry out the requested services accurately and professionally, and to represent the relevant data in a clear and concise manner; no responsibility or liability will be accepted by Animalia Zoological & Ecological Consultation CC. And the client, by receiving this document, indemnifies Animalia Zoological & Ecological Consultation CC and its staff against all claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by Animalia Zoological & Ecological Consultation CC; and by the use of the information contained in this document. The primary goal of Animalia's services is to provide professionalism that is to the benefit of the environment as well as the community.

Appendix A

Envirokey

Desktop Study

For

Portion 65 of the Farm Klipriviersberg - 106 I.R.

EnviroKey

P O Box 11101
Vorna Valley
Midrand
1686

Phone: 011 468 2380
Fax: 088 270 9637
E-mail: shaun2taylor@gmail.com

EnviroKey

1. Introduction

A desktop study was undertaken for Portion 65 of the Farm Klipriviersberg 106 IR in order to determine preliminary baseline information for the site. Figures 1, 2 & 3 represent the findings derived from the desktop analysis.

2. Desktop Survey

According to data obtained from the Gauteng Department of Agriculture and Rural Development (GDARD), utilising information from the Conservation Plan (C-plan version 2 of 2004) for Gauteng, the desktop study indicates that the study site (Figure 1 – Locality Map) is approximately 164 hectares in size and is located inside the urban edge. This implies that should a wetland or riparian zone be found on site, a minimum 30 metre buffer zone is to be demarcated from the delineation line. Any other sensitive areas will also need to invoke their respective buffer zones accordingly. Figure 2 illustrates the environmental features of the site. A non-perennial river flows directly through the centre of the site bisecting it to the west and east. Topographically, the site holds a class 2 ridge which stems from the southern border of the site and extends to the centre. More generally, the site contains areas identified as irreplaceable. This area is deemed irreplaceable on account of abiotic and biotic factors. The biotic factors include sensitive bird habitat, invertebrate species and plants. On the other hand, abiotic features include the ridge and non-perennial river. A site inspection should take place by a suitably qualified environmental practitioner or ecologist to ascertain whether these sensitive features occur or are likely to occur on site and whether specialist studies will be needed.

Lastly, figure 3 indicates that according to the Gauteng Agricultural Potential Atlas (GAPA) of 2004, the site is predominantly located on soil considered to be of a very low agricultural potential. This may therefore, not be considered a viable or potential alternative land use for the site.

Figure 1. Locality Map of Klipriviersberg 106 I.R.

Figure 2. Sensitive Features Map

Figure 3. Agricultural Potential Map

3. Conclusion

The concerned site is located inside the urban edge of Gauteng. Hence, for any sensitive environmental features, the designated buffer zones should be applied. The desktop analysis revealed that the site contained a ridge and non-perennial river. Additionally, irreplaceable sites in terms of land (river and ridge), insects (invertebrate), plant as well as animal habitat (bird) could potentially be found on site. Therefore, it is recommended that a suitably qualified environmental practitioner or ecologist should investigate the site to ascertain whether these sensitive features occur or are likely to occur on site and whether further specialist information will be needed prior to any development. Lastly, the agricultural potential of the site is expected to be very low.

Appendix B

Werner C. Marais

P.O. Box 6892, Weltevredenpark, 1715. Phone 078 190 3316. werner@animalia-consult.co.za

- **Initiation of PhD (Biodiversity and Conservation) - 2009**
- **MSc (Biodiversity and Conservation) - 2008**
  - The potential of using insectivorous bats (Microchiroptera) as a means of insect pest control in agricultural areas.
- **Hons (Biodiversity and Conservation) - 2006**
  - Research project: Preliminary study of the terrestrial Arthropoda associated with bat guano in caves of the Cradle of Humankind World Heritage Site
- **BSc (Zoology and Botany) – 2005**

- ***Attended the Terrasoil Wetland Delineation and Soil Classification Course***

Affiliations to professional bodies and societies

- International Association for Impact Assessment – South Africa (IAIAsa)
- Zoological Society of Southern Africa (ZSSA)
- Entomological Society of Southern Africa (ESSA)
- Society for Conservation Biology (SCB)
- Herpetological Association of Africa (HAA)
- Bat Conservation International (BCI)
- Serving on the research committee of the Gauteng and Northern Regions Bat Interest Group (GNoRBIG).
- Pending Pr.Sci.Nat. – SACNASP (Ecology)

Experience

Animalia Zoological & Ecological Consultation CC

- Wetland delineation for the proposed Coolbreeze development on the farm Spaarwater, Ekurhuleni.
- Wetland delineation for the proposed development on the farm Witpoortjie 23IR, Ekurhuleni, Gauteng.
- Riparian development for a proposed township in Rembrandt Park Ext. 13.
- Riparian delineation for the proposed township on Portion 571 in Boschkop 199 I.Q.
- Specialist survey of wetland mammals on Kookfontein farm, Vereeniging.
- Specialist survey of amphibians in the Sasolburg area.
- Specialist survey of reptiles in the Kibler Park area, Gauteng.
- Freelance consultation on artificial housing of bats and bat house design.
- Cave specialist study for a proposed water pipeline in Laudium, Gauteng.
- Cave specialist study for the Apies River: Fountains Access project in Pretoria.
- Ecological study for the proposed Coolbreeze development on the farm Spaarwater, Ekurhuleni.
- Specialist survey of Bullfrog (Pyxicephalus adspersus) in Rynfield, Benoni.
- Specialist bullfrog rehabilitation plan compilation for a stand in Rynfield, Benoni.
- ESO of bullfrog rehabilitation process
- Specialist study of Bullfrog (Pyxicephalus adspersus) in Withok Estates, Brakpan.
- Specialist reptile study for Janho Quarry in Gauteng.