

WEST RAND DISTRICT MUNICIPALITY WETLAND REPORT | 2017

LOCAL ACTION FOR BIODIVERSITY (LAB): WETLANDS SOUTH AFRICA



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SANBI
Biodiversity for Life
South African National Biodiversity Institute



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FOREWORD



The world today is faced with changing climate conditions which in most instances results in natural disasters. These disasters also erode our natural resources, like wetlands and catchments.

Wetlands are one of the most valuable and diverse ecosystems on the planet and are essential for human existence. Wetlands clean the water we drink as well as provide nutritious food in the form of plants and fish. Wetlands also provide organic materials which can be used for medicinal purposes. They help protect us from flooding and storm surges and also have the ability to store water which is then released in times of drought. They provide key habitat for a significant array of critically endangered flora and fauna. Wetlands also play a key role in the mitigation of climate change, which is predicted to have a major impact on human livelihoods, as they can store large amounts of carbon and thus can help with the regulation of greenhouse gases, thereby assisting in slowing down climate change.

Despite the essential role wetlands play in maintaining the delicate balance of life on Earth, they are being lost and degraded at an unprecedented rate, faster than any other ecosystem in the world. Since the 1900s, it is estimated that 64% of the world's wetlands have been destroyed. In South Africa, 50% of the country's wetlands has been lost and 48% of the remaining wetlands are critically endangered. The astounding loss of the wetlands systems worldwide is

largely as a result of wetland areas being 'reclaimed' for expanding urban development or agricultural expansion as well as encroachment of invasive alien vegetation. As a result, species which once populated these areas in vast numbers are seeing a rapid decline and countless animals and plants have been brought to the verge of extinction. Wetlands are also increasingly unable to perform the ecosystem services so vital for human life.

In the 21st century we need wetlands more than ever before. The conservation and the management of wetlands in a holistic, collaborating and effective manner is therefore essential to sustain human livelihoods and local economies, protect our valuable biodiversity and buffer the impacts of climate change.

ALDERMAN BOYCE
MAKHOSONKE MANELI
Executive Mayor:
West Rand District
Municipality



ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY

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ICLEI – Local Governments for Sustainability is the leading global network of over 1,500 cities, towns and regions committed to building a sustainable future. By helping the ICLEI Network to become sustainable, low-carbon, ecomobile, resilient, biodiverse, resource-efficient, healthy and happy, with a green economy and smart infrastructure, we impact over 25% of the global urban population.

ICLEI Africa’s work is conducted by a dynamic and passionate team of professionals that seek to work with cities to ensure a more sustainable future, with a specific focus on urban biodiversity matters.

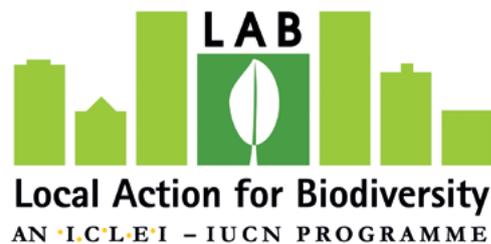
In order to strengthen the role cities and local governments play in the pursuit of greater sustainability through the collaborative design and implementation of integrated urban development and effective biodiversity management, the ICLEI Cities Biodiversity Center (ICLEI CBC) was created in 2009. The ICLEI CBC is located in Cape Town, South Africa, embedded in the Africa Regional Office of ICLEI. We offer cities a broad portfolio of supportive services through our dedicated team of passionate, skilled and dynamic biodiversity and urban development experts.



ICLEI CITIES BIODIVERSITY CENTER

LOCAL ACTION FOR BIODIVERSITY PROGRAMME

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The ICLEI Cities Biodiversity Center aims to create BiodiverCities, which promote urban biodiversity for the many benefits they offer, including human well-being, poverty alleviation, habitat conservation, air and water quality, climate change adaptation and mitigation, food provision, fortified infrastructure resilience, and happiness of citizens.

BiodiverCities are aware that ecosystem services contribute towards many essential municipal services, as well as towards the local economy, sustainability and social well-being of their cities. Biodiversity in cities provides a critical contribution towards achieving the global biodiversity targets. It

buffers further biodiversity loss, improves the urban standard of living, and provides local opportunities for global education and awareness.

ICLEI's Local Action for Biodiversity (LAB) programme is a unique global biodiversity programme run by The ICLEI Cities Biodiversity Center. The LAB Program is aimed at improving and enhancing ecosystem management at the local level, and is recognized globally as the leading results-driven local government biodiversity initiative. Currently, LAB is working on wetland restoration in South Africa under the Local Action for Biodiversity: Wetlands South Africa (LAB Wetlands SA) project.



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LIST OF ACRONYMS

AS	Africa Secretariat	NEM: WA	National Environmental Management: Waste Act
BGIS	Biological Geographic Information Systems	NFEPA	National Freshwater Ecosystem Protection Area
CBA	Critical Biodiversity Areas	NGO	Non-Government Organisation
CEPA	Communication, Education and Public Awareness	PRECIS	Pretoria Computerised Information System
CIP	Climate Information Platform	SALGA	South African Local Government Association
CSAG	Climate Systems Analysis Group	SANBI	South African National Biodiversity Institute
CSIR	Council for Scientific and Industrial Research	SANParks	South African National Parks
DEA	Department of Environmental Affairs	SDF	Strategic Development Framework
EIA	Environmental Impact Assessment	SPLUMA	Spatial Planning and Land Use Management Act
EMF	Environmental Management Framework	UNFCCC	United Nations Framework Convention on Climate Change
ESA	Ecological Support Areas	UCT	University of Cape Town
GDP	Gross Domestic Product	WfW	Working for Wetlands
GIS	Geographic Information System	WMA	Water Management Area
CBC	Cities Biodiversity Centre	WRDM	West Rand District Municipality
ICLEI	ICLEI – Local Governments for Sustainability	WWTW	Waste Water Treatment Works
IDP	Integrated Development Plan		
LAB	Local Action for Biodiversity		
MTSF	Medium Term Strategic Framework		
NEMBA	National Environmental Management: Biodiversity Act		

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EXECUTIVE SUMMARY

West Rand District Municipality is located in the Gauteng Province of South Africa and covers an area of 4 095 km². The Municipality falls within the Grassland biome and is home to a disproportionately high percentage of rare and threatened species and threatened ecosystems.¹ West Rand District Municipality Critical Biodiversity Areas (CBA) cover 27.5% of the district. The Ecological Support Areas (ESA) cover a further 19% of the district. Protected areas cover just over 2% of the municipality.

Biodiversity offers an immense opportunity to support the country's development path by providing many free goods and services which contribute to water and food security as well as quality of life. Wetland ecosystems in particular offer numerous ecosystem services which contribute to municipal service delivery. These services include, but are not limited to, water purification, erosion control and habitat provision for wetland dependent species. Wetlands however are South Africa's most threatened ecosystem and are extremely poorly managed resulting in large scale degradation. This is largely due to the benefits of wetlands being poorly understood and as such there is an urgent need to increase awareness of wetland importance and to incorporate natural wetland resource considerations into municipal governance mechanisms and planning. In West Rand District Municipality, aquatic ecosystems are among the eight nationally listed threatened ecosystems of which 83% of wetland systems and 39% of river systems within the district are listed as threatened.

Just under two thirds of the district (63%) is in a natural or near-natural state, with the remaining 37% of the district being made up of urban areas (6%), intensive agriculture (28%) and mining (3%).¹

Freshwater is the district's most limiting natural resource. Industrialisation, mining and urbanisation as well as rapid population growth have since become the largest water users and heavily affect water management activities. It is imperative that South Africa develops both a water-efficient economy together with a social ethic of water conservation and ultimately a culture of sustainability of water resource use.

Currently there is no specific designated wetland management authority or capacity for management within West Rand District Municipality. Instead, the management of wetlands is a collective effort. Various external local stakeholders play an active role in wetland management through the implementation of local projects and general monitoring and regulation initiatives. Wetlands are also considered in the decision making of the multiple forums, platforms and working groups throughout West Rand District Municipality.

To streamline and improve the management of wetlands, West Rand District Municipality is implementing the Local Action for Biodiversity: Wetlands South Africa (LAB: Wetlands SA) project with support from ICLEI Africa Secretariat (ICLEI AS). The LAB: Wetlands SA project aims to ensure the protection of priority natural wetland resources, thus enabling the supply of ecosystem services, and promoting resilient communities and sustainable local economies under a changing climate within South African local governments. Through the development of this Wetland Report, ICLEI AS will assist West Rand District Municipality in identifying the gaps in wetland management and assist with devising improved wetland management strategies going forward.

INTRODUCTION

South Africa is endowed with a rich wealth of biodiversity, which offers an immense opportunity to support the country's development path by providing many goods and services which contribute to municipal service delivery, water and food security, and quality of life, especially under a changing climate. Wetlands in particular, are high-value 'ecological infrastructure', providing critical ecosystem services such as clean water, clean air, food, medicines, water storage and habitat for biodiversity. Wetlands also play a role in disaster management, and could lessen the negative effects of climate change through flood attenuation, temperature regulation and water and food security.

Wetlands however are South Africa's most threatened ecosystems, with 48% of wetland ecosystems critically endangered,² resulting in an urgent need to increase awareness of wetland importance and to incorporate natural wetland resource considerations into municipal governance mechanisms and planning.

The Municipalities of Gauteng Province are home to a high proportion of South Africa's mining activity, heavy industry, commercial enterprise and urban population. The resulting pressures placed on the

environment and the remaining natural ecosystems are very high and the loss of habitat and ecological processes is expected.

The Local Action for Biodiversity: Wetlands South Africa (LAB: Wetlands SA) Project works with 11 municipalities across South Africa to build institutional capacity and develop local policies for integrating biodiversity and specifically wetlands across local government departments. The project is implemented by ICLEI Local Governments for Sustainability Africa Secretariat (ICLEI AS) through the ICLEI Cities Biodiversity Center (CBC) with key partners such as South African Biodiversity Institute (SANBI), South African Local Government Association (SALGA), Working for Wetlands (WfW) and the Department of Environmental Affairs (DEA). The project is based on the globally-renowned LAB Pioneer Programme methodology.

This report draws together the range of knowledge about wetlands in West Rand District Municipality and provides a detailed overview of the stakeholders and programmes working towards improved wetland management in this region.



FIGURE 1: West Rand District Municipality in relation to the rest of South Africa.

1 | WHAT IS A WETLAND?

“Wetlands are 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.”

National Water Act No. 36 of 1998

A wetland is a feature in the landscape which is saturated with water for a long enough period that the soil conditions change (mottling as a result of the low oxygen conditions) and the vegetation shifts to respond to these changes.

Six different types of wetlands occur across the country. These vary based on the underlying geology and include seeps, depressions, wetland flats, floodplain wetlands, channelled valley bottom wetlands and unchannelled valley bottom wetlands.⁴ SANBI has compiled a detailed hydro-geomorphic classification system to assist with wetland identification. An illustrative overview from this guide on the different types of wetlands is included in **Figure 4**.

Wetlands also vary on a temporal scale based on the climate and season. As such, once a wetland type has been established, it can then be categorised into either a temporary, seasonal or permanent wetland. A temporary wetland is saturated for a very short period (approximately one month) during the rainy season only. Vegetation associated with this type of wetland are predominantly grass species, as well as a mixture of species that occur in non-wetland areas and hydrophytic plants that are largely restricted to wetland areas. A seasonal wetland is saturated for most of the growing season. Vegetation associated with this type of wetland are predominantly sedges and grasses that are restricted to wetland areas, usually < 1 m tall. Lastly, a permanent wetland is saturated all year round. This type of wetland is dominated by highly specialised aquatic plants adapted to permanently wet conditions.⁵



FIGURE 2 & 3: Mottled soils indicative of a wetland (top) and specially adapted wetland vegetation (bottom).³

1 WHAT IS A WETLAND? (continued)

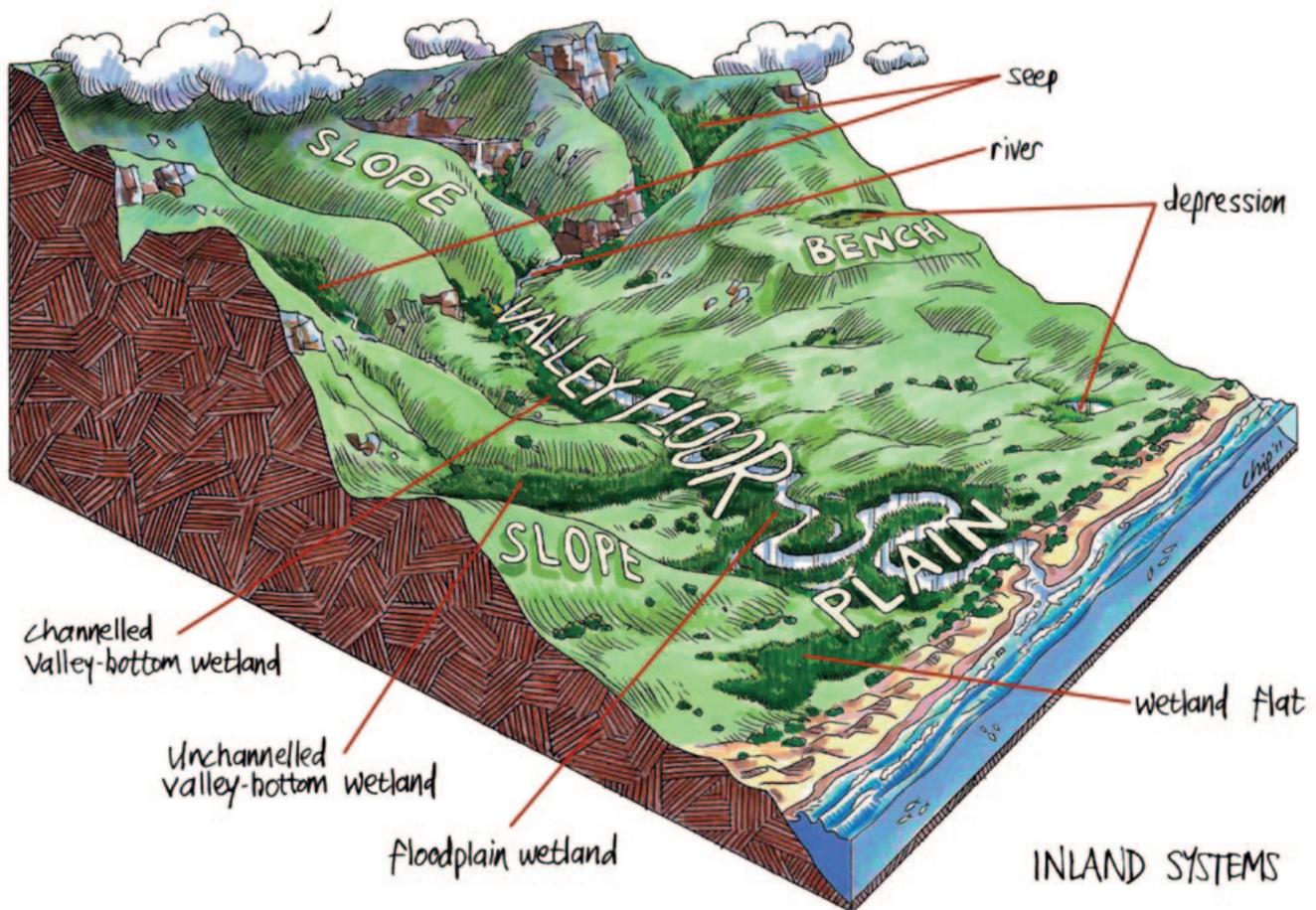


FIGURE 4: Wetland systems within South Africa.⁶

All wetland types can be classified as high value ecological infrastructure due to the large number of ecosystem services that they provide. Wetland ecosystem services can be classified into four separate categories namely provisioning services, regulating services, cultural services and supporting services.⁷ Provisioning services can be described as the products one can physically obtain from wetlands such as fresh water, food and natural medicines. Regulatory services can be described as the benefits one receives from the wetland such as stream flow regulation, erosion control, water filtration and flood attenuation. Cultural services are the nonmaterial benefits that one can obtain from wetlands such as spiritual enrichment, sense of place and aesthetic experience. Lastly supporting services are the services

provided that are necessary for the production of all other ecosystem services namely, nutrient cycling and water cycling.

It should be noted that ecosystem services provided by wetlands come at no cost to the municipality and as such, all that needs to be done to ensure continued provision of these services is to protect and maintain local wetlands. However, the inappropriate management of wetlands can cause a loss of wetland area and a subsequent loss of ecosystem services. This results in municipalities having to invest in expensive infrastructure (e.g. water filtration plants or flood barriers) to ensure the same level of service delivery.

2 | WHAT IS BIODIVERSITY?

“The variability among living organisms from all sources, including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.”

National Environmental Management: Biodiversity Act No. 10 of 2004

To expand on this, biological diversity or the shorter more commonly used term biodiversity, is the variety of genes, species and ecosystems on Earth, and the processes that maintain this diversity. It is the living species and natural processes that constitute nature. Rather than simply considering plant and animal populations (i.e. total numbers), biodiversity reflects the variability of plants and animals and crucially, the processes by which they are supported, and the functions that they deliver.

Essentially, as biodiversity includes natural processes, it describes the health and functioning of a given area. For example, if a wetland becomes polluted and its ecological condition deteriorates, it is no longer able to function correctly and natural processes such as providing food (e.g. fish), materials (e.g. reeds) and water purification no longer take place. The real value in the term biodiversity is that by describing the variety of life forms rather than total numbers, biodiversity can be used at any scale (e.g. for landscapes such as grasslands or a habitat such as a woodland or koppie) to reflect the health of any area – not just wild landscapes, but pockets of biodiversity such as wetlands, too.



FIGURE 5: The Highveld Blue Butterfly (*Lepidochrysops praeterita*).⁸

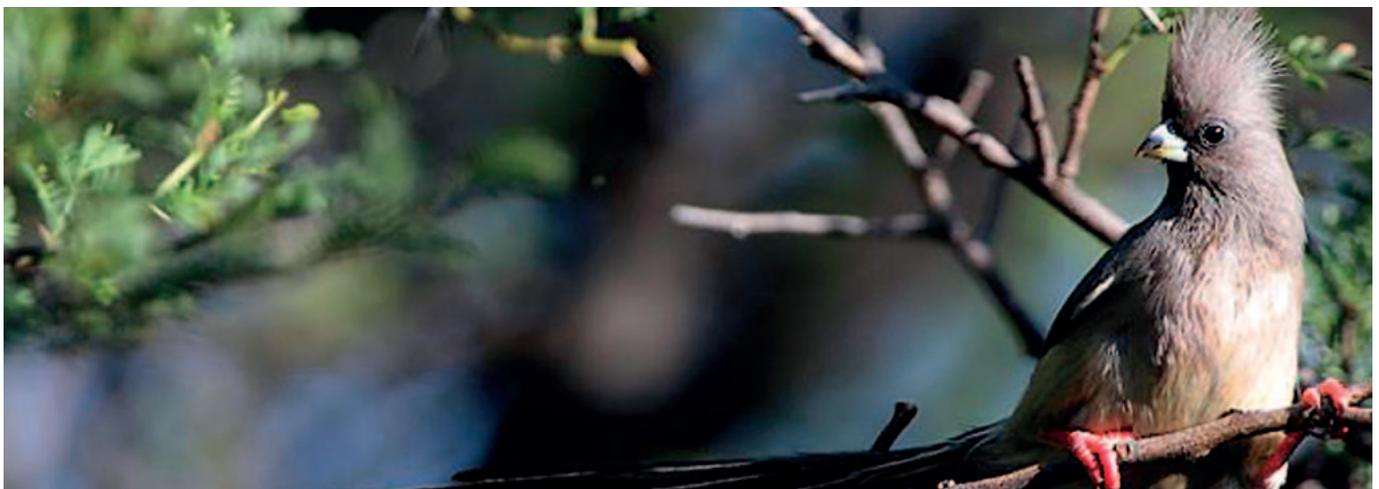


FIGURE 6: White-backed-Mousebird (*Colius colius*).⁹

3 | WETLANDS AND BIODIVERSITY IN WEST RAND DISTRICT MUNICIPALITY

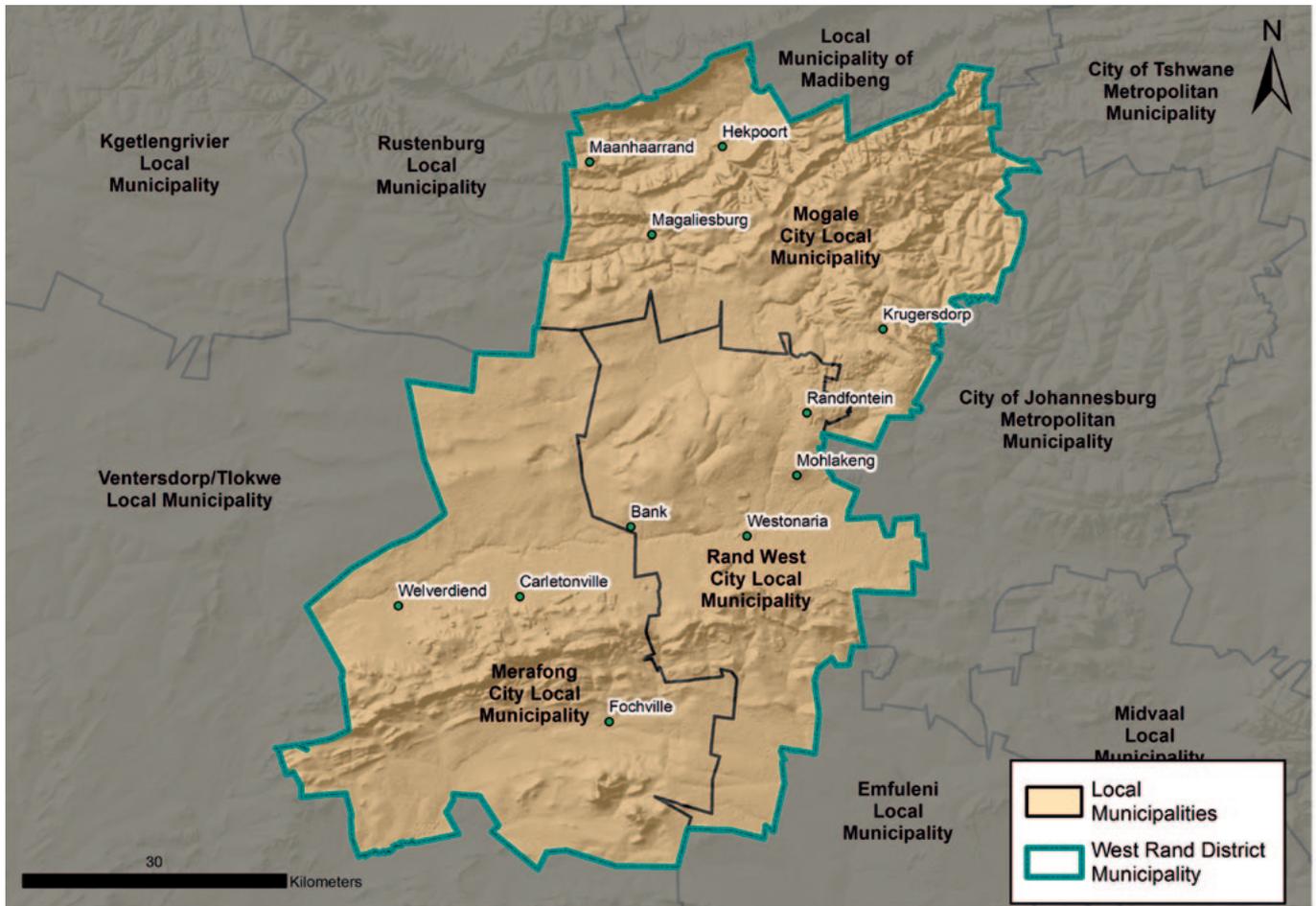


FIGURE 7: West Rand District Municipality with its local municipalities.

The report covers West Rand District Municipality, which consists of three local municipalities namely: Mogale City Local Municipality, Merafong City Local Municipality and Rand West City Local Municipality (formerly Randfontein and Westonaria). West Rand District Municipality covers an area of 4 095 km² and includes the towns of Roodepoort and Krugersdorp. The district is bordered by Bojanala Platinum District Municipality to the North-West, City of Tshwane to the North-East, City of Johannesburg to the East, Sedibeng to the South-East and Dr. Kenneth Kaunda to the South-West (**Figure 7**).

Just under two thirds of the district (63%) is in a natural or near-natural state with the remaining 37% of land area comprising of urban areas (6%),

intensive agriculture (28%) and mining (3%).¹⁰ Within the natural areas of West Rand District Municipality, aquatic ecosystems are prominent however aquatic systems are under severe threat and are listed as one of the eight nationally listed threatened ecosystems. 83% wetland systems and 39% river systems within the district are listed as threatened.

This section will provide information on existing maps, information on the known key wetlands in the district as well information on the key flora and fauna species associated with wetlands in the West Rand District Municipality. This section also provides detail on the value of wetlands to the district and highlights the key threats to wetlands within the district.

3.1 MAPPING WETLANDS IN WEST RAND DISTRICT MUNICIPALITY

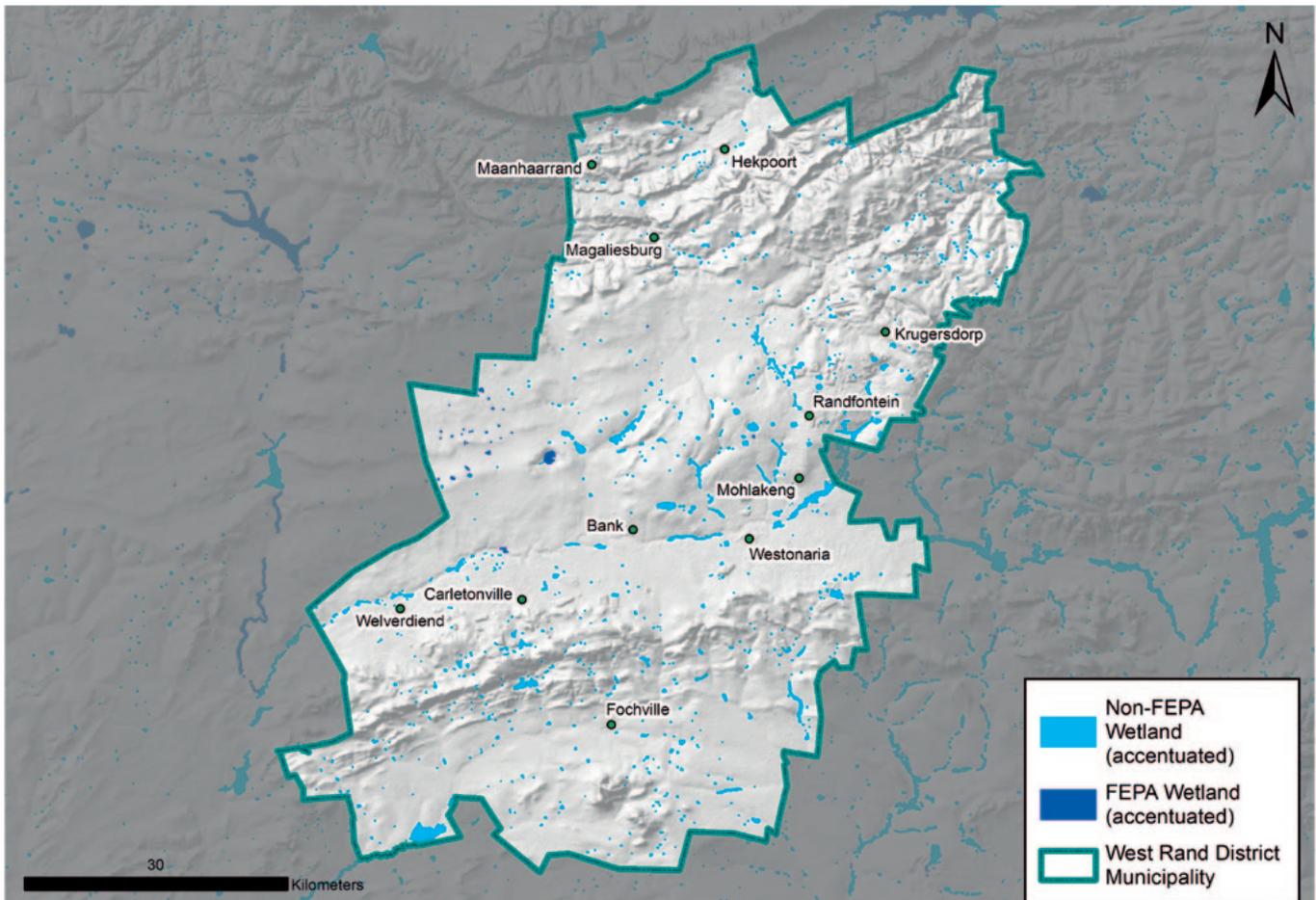


FIGURE 8: Map indicating the spatial distribution of the NFEPA wetlands within West Rand District Municipality.¹¹

At this stage there is no specific ground-truthed wetland map available for West Rand District Municipality. SANBI's National Freshwater Ecosystem Priority Area (NFEPA) provides a broad national-level overview of where wetlands are located within the landscape including individual wetlands and clusters of wetlands which are considered to be of regional or national importance. Using the mapping tool on the SANBI BGIS website, <http://bgis.sanbi.org/MapView>, it is possible to generate a NFEPA Wetland map for a given area with minimal GIS skills. These maps can be used as a first-level or preliminary assessment of wetland occurrence within the municipality (**Figure 8**).

It should be noted that the NFEPA wetland map is based predominantly on remote-sensing imagery (which does not always detect features on the ground) and at this stage is largely not ground-truthed. As such the data should be treated with caution and for initial planning only, as some wetlands may not be reflected (e.g. a number of known seeps occurring within the municipality are not reflected in the NFEPA wetland map, whilst a number of farm dams are). Despite these limitations, the NFEPA wetland map is thought to provide the best available indication of true wetland distribution data across the country and although the spatial representation of wetlands cannot be considered as definitive, it does provide an indication of relative wetland occurrence, size and density across the municipality.

3.1 MAPPING WETLANDS IN WEST RAND DISTRICT MUNICIPALITY *(continued)*

Based on the maps currently available, it is clear that there is a real need for wetland mapping and comprehensive ground-truthing to be undertaken within the municipality to assist with accurate planning going forward. This could be achieved by incorporating

a GIS specialist into the existing municipal structure to undertake the required mapping or by employing a wetland specialist to ground-truth wetlands within West Rand District Municipality and developing a wetland map accordingly.

3.2 KEY WETLANDS IN WEST RAND DISTRICT MUNICIPALITY

3.2.1 The Abe Bailey Nature Reserve

The Abe Bailey Nature Reserve is situated near Carletonville on West Rand. The reserve is named after the mining magnate, Sir Abe Bailey, who farmed and hunted in the area during the early part of the last century and whose original hunting lodge now serves as the reserve offices. The reserve is approximately 4 200 ha in extent.

The reserve is predominantly comprised of Carletonville Dolomite Grassland and associated wetlands with scattered caves and patches of broad-leaved and *Acacia* woodland. The wetland itself is diverse, ranging from dense reed beds to shallow open water, patches of short emergent vegetation, extensive areas of flooded grassland and narrow mudflats. The combination of wetland, grassland and bush habitat makes this a rewarding birding destination at any time of year.



FIGURE 9: The wetland at the upstream end of Abe Bailey Nature Reserve.¹²

Some of the bird fauna of the reserve include: Paradise Flycatchers, Karoo Thrushes, Cape Robin-Chats, Grey-headed Sparrows, Glossy Starlings and Cape White-eyes, Black-collared, Pied and Crested Barbets, Black-eyed and Red-eyed Bulbuls, Speckled, Red-faced and White-backed Mousebirds, African Hoopoes, Diedericks Cuckoos, Chestnut-vented Titbblers, Blue Waxbills, Black-throated Canaries, Black-chested Prinia, African Rails, Black Crakes, Squacco Herons and Little Bitterns, Avocets, Black-winged Stilts, Three-banded Plovers, Ruffs, Marsh and Wood Sandpipers and African Snipes.

3.2.2 Urban Wetlands within Merafong City Local Municipality

There are three key urban wetlands located within Merafong City Local Municipality:

1. Loopspruit (*Khutsong*)

Loopspruit (*Khutsong*) is a small wetland that has been artificially enlarged by culverts and mine water discharge. Despite the discharge entering the wetland systems, the wetland is in relatively good condition and provides a substantial amount of ecosystem services including water retention, provision of medicinal plants, habitat, water regulation, purification and waste treatment (sediment, nitrogen based, mine pollutants), erosion control, pollination, recreational, aesthetic, nutrient cycling, biodiversity.

2. *Wedela*

Wedela wetland is a seep wetland that has been badly disturbed by grazing, dumping and storm water seeps. As a result of the ongoing degradation to the system, the wetland is in poor condition and currently ecosystem service provision is limited.

3.2 KEY WETLANDS IN WEST RAND DISTRICT MUNICIPALITY *(continued)*

3. Piet Viljoen Park

Piet Viljoen Park is an artificially created dam which is associated with wetlands systems located on the on the inflow side. The wetland systems are in relatively good condition and provide a number of

ecosystem services including habitat provision, water purification (sediment, mine pollution) and erosion control. The wetland systems also provide a location for recreational activities such as fishing and acts as a food source for previously disadvantaged residents).

3.3 KEY FLORA AND FAUNA OF WEST RAND WETLANDS

According to the Gauteng C-Plan v3.3, 27.5% of West Rand District is designated as a Critical Biodiversity Area (**Figure 10**).¹³ Most Critical Biodiversity Areas remain poorly protected, and scope for protected area expansion is relatively limited. There are at least 12 threatened plant species and 20 threatened animal

species within West Rand District Municipality as well as eight nationally listed threatened ecosystems (Please refer to **Annex 1** for a full list of key fauna and flora in need of conservation in West Rand District Municipality).

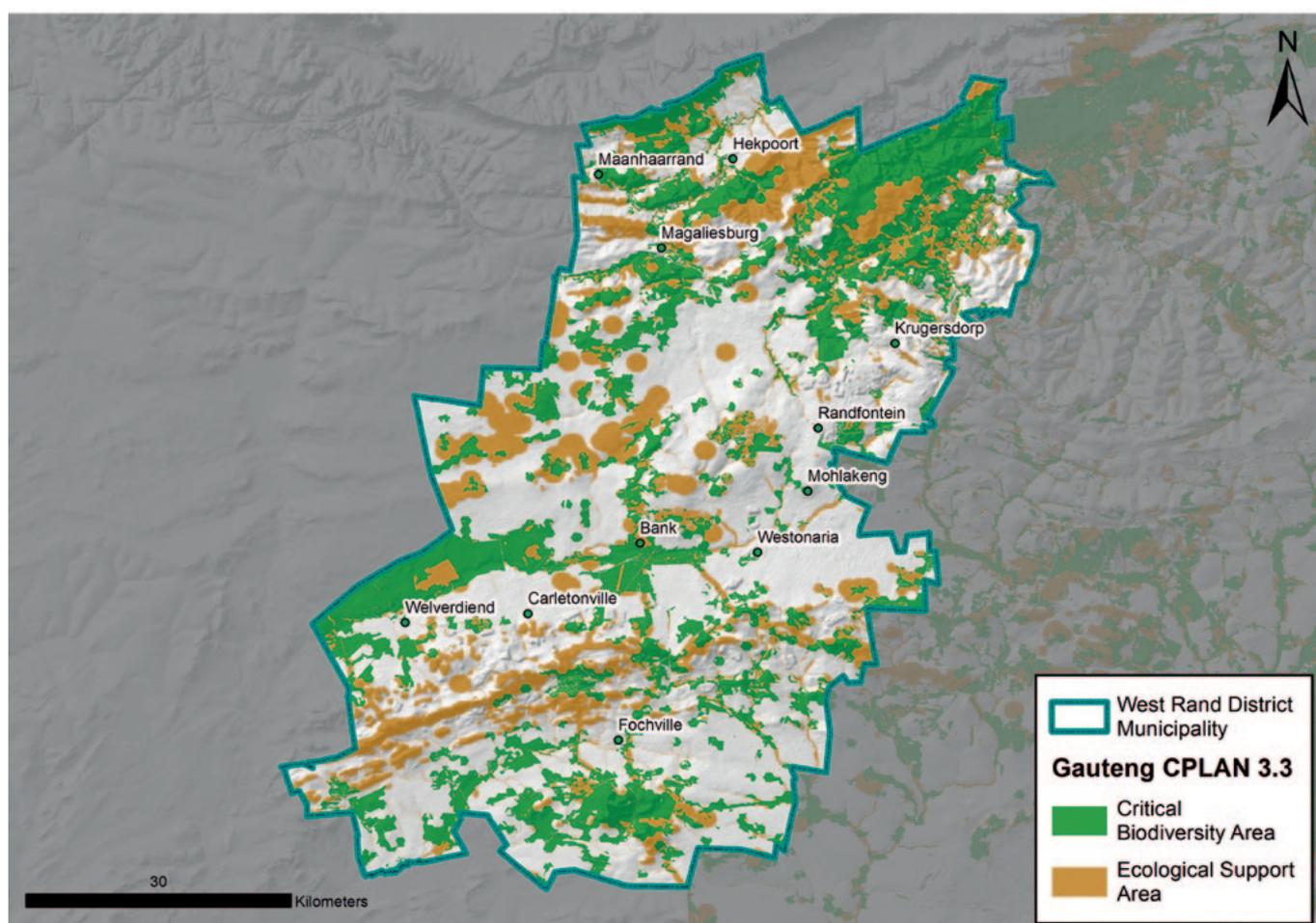


FIGURE 10: Critical Biodiversity Areas and Ecological Support Areas within West Rand District Municipality.¹⁴

3.3 KEY FLORA AND FAUNA OF WEST RAND WETLANDS *(continued)*

3.3.1 Flora

An examination of the threatened plant species records held within the National Herbarium Pretoria Computerised Information System (PRECIS), supplemented by provincial records, shows that 12 of the 42 threatened plant species recorded for the Gauteng Province occur in West Rand District Municipality. These include three endangered and nine vulnerable species. In addition there are a number of other plant species which are not threatened nationally, but are still of local concern because they are listed as near-threatened, rare or declining (**Annex 1**).

3.3.2 Fauna

In addition to the specially adapted plants that occur within West Rand District Municipality, a variety of key fauna species also occur. Eight vulnerable species and four near-threatened species of birds are particularly reliant on the Gauteng region for suitable habitat, and a number of others also occur occasionally. A high proportion of these species of special concern are found within West Rand District Municipality. These include 4 vulnerable species that are partially or fully wetland-dependent, a further 5 species that

are not specifically associated with wetlands, and 7 near-threatened species.

Eight of Gauteng's mammal species of conservation concern are found in West Rand District Municipality. These include the endangered White-Tailed Mouse (*Mystromys albicaudatus*) and two near-threatened species, the Southern African Hedgehog (*Atelerix frontalis*) and Spotted-necked Otter (*Hydriectis maculicollis*). A number of cave-dwelling bats of special concern are also found in the region. These include one vulnerable species and four other near-threatened species.

Gauteng is important for at least four threatened invertebrate species. Two of these, Stobbia's Fruit Chafer Beetle (*Ichnestoma stobbiai*) and the Highveld Blue Butterfly (*Lepidochrysops praeterita*), which are both likely to be listed as vulnerable, are found in West Rand District Municipality. The Giant Bull frog (*Pyxicephalus adspersus*)¹⁵ which is not listed as threatened globally but is listed as a protected species in South Africa, can also be found in the wetlands systems of West Rand District Municipality.



FIGURE 11: Stobbia's Fruit Chafer Beetle (*Ichnestoma stobbiai*).¹⁶



FIGURE 12: Black crane (*Porzana flavirostra*).¹⁷



FIGURE 13: The Giant Bull frog (*Pyxicephalus adspersus*).¹⁸

3.4 CHANGES OF FRESHWATER ECOSYSTEMS OVER TIME

Wetland and water catchment systems throughout the Gauteng Province have undergone drastic modification since the discovery of gold in the region and the commencement of large scale mining. The majority of alterations to/removal of wetland systems occurred before the era of biodiversity conservation and as a result wetland loss was drastic during this period.

West Rand District Municipality area is characterized by the valley bottom wetland systems associated with the Wonderfonteinspruit, Leespruit, Loopspruit and other tributaries.¹⁹ However, the majority of these wetland systems are largely modified as a result of current and historic mining activities that have occurred in the district. Mine residue dumps remain one of the major pollutants in the area. Another water pollution aspect associated with mining is the decanting of acid mine drainage from the mine voids onto surface water. This acid mine drainage is rich in mineral deposits and highly acidic.

West Rand District Municipality is largely underlain by dolomite. The geological characteristics of this rock type makes the region prone to the formation of sinkholes. Although West Rand District Municipality has historically had many small wetland systems in the same areas as the underlying dolomite geology (**Figure 15**), due to the increased risk of sinkhole formation in wetland areas overlaying dolomite, many if not all natural freshwater systems in these increasingly urban/ industrialised areas have been modified to prevent water re-entering the water table and causing instability.²¹ These modifications to these water systems are institutionally inherited and changing them is unlikely. In addition, rehabilitating degraded or damaged wetlands within areas underlain by dolomite also carries the risk of additional sinkhole formation and as such all water extracted from these areas is diverted to the Wonderfonteinspruit basin via different surface pipelines or channels. Further detail regarding the policies in place enforcing this practice is outlined below.



FIGURE 14A & 14B: Modified (channelized) surface flow at the Eye of Wonderfontein near Abe Bailey Nature Reserve. The natural freshwater system has been completely modified to prohibit water from returning to the Dolomitic water table.²⁰

3.4 CHANGES OF FRESHWATER ECOSYSTEMS OVER TIME *(continued)*

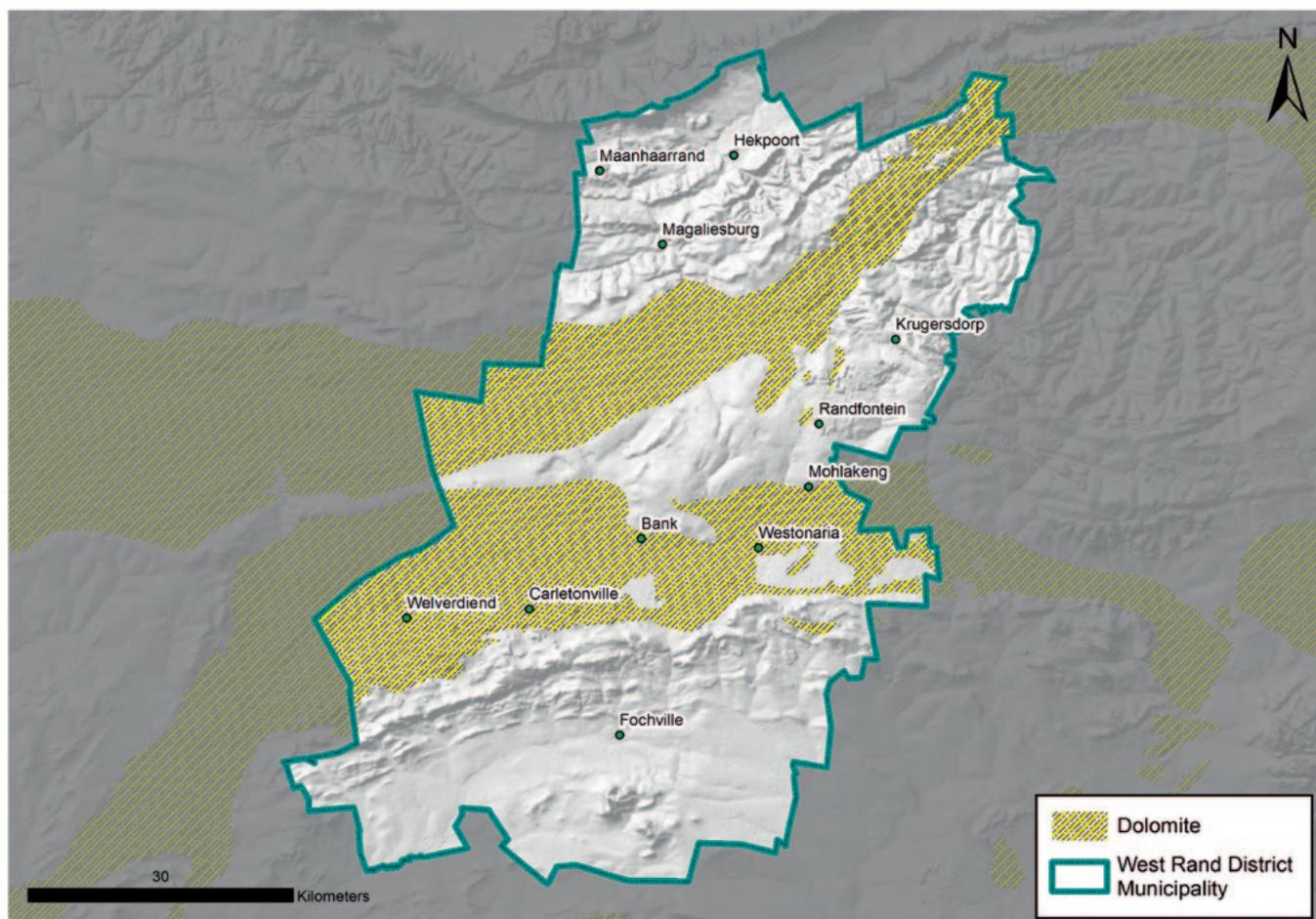


FIGURE 15: Location and depth of Dolomite rock formations in West Rand District Municipality.

1938 – 1964: Development of the “dewatering policy”

The first settlers were attracted to the area by a perennial supply of excellent quality dolomitic water. From their original base, near the present Potchefstroom, agriculture spread up the Mooi River to its source at Bovenste Oog and along the Wonderfonteinspruit to Gembokfontein. It was the discovery of the Zuurbekom aquifer and the commencement of the large volume extraction from the aquifer in 1892 that allowed the settlers camp to grow into Johannesburg, one of the most important metropolitan areas on the African continent.²²

It did not take long for the volume of water pumped from shafts at Zuurbekom to reduce the flow of the Klip River, the decline of which became evident in the late 1890s. This, as can be expected, led to a

confrontation between the Johannesburg Water Company, who were selling the water, and the local farmers, who were using water from the Klip River spring to irrigate their farms.

An Inter-Colonial Irrigation Commission was appointed to produce an Interim Report on the required precautions necessary, when dealing with subterranean water, more especially in areas situated on the underlying dolomite. The recommendations of the Inter-Colonial Commission were taken up in Act No. 8 of the Irrigation and Water Conservation Act of 1912, with the dolomitic areas of the Far West Rand finally being accorded statutory protection as Subterranean Water Controlled Areas in 1913.²³

Matters remained unchanged, with extraction rates exceeding flow rates three fold, resulting in the eye

3.4 CHANGES OF FRESHWATER ECOSYSTEMS OVER TIME *(continued)*

of Venterspost to dry up between 1947 and 1949. After completing a four-year study, one of the most comprehensive hydrological investigations conducted in the area thus far, the Committee handed a Final Report to the Minister during November of 1960 to be treated as “confidential”. It is interesting to note that the Lower Wonderfontein eye ran dry during the tenure of the Committee in September 1959, a direct result of the dewatering activities in the area, well before an official decision on policy was taken by Government.

This dewatering activities soon turned into a curse, when the surface area became pock-marked with sinkholes that followed the significant drop in the groundwater table.^{24 and 25}



FIGURE 16: An example of a sinkhole in West Rand District Municipality.²⁶

A major mining house owning the West Driefontein Mine where the ingress of water was rapidly increasing and who were also responsible for dewatering the Venterspost Compartment, was well aware of the savings that an official dewatering policy would bring to its balance sheet and pressed Government to allow the abstracted groundwater to be discharged beyond the boundaries of the dolomitic compartment, contrary to the spirit of the existing Regulations and rights of the farmers. Another mining house on the

other hand, who's Blyvooruitzicht mine had reached a more, or less stable rate of pumping and where the surplus water was returned to the compartment from which the water was drawn (i.e. the Oberholzer Compartment), did not support the proposed dewatering option that was suggested by the initial mining house.²⁷

It needs to be recorded that only the Mines were given access to the confidential Final Report and only the Mines were asked for comments which were expected before the end of the Parliamentary session. It can be assumed that since the Oberholzer Irrigation Board was neither privy to the Final Report nor called upon for comment that the irrigation rights of the farmers were no longer of concern. As happened, the mines failed to respond as requested by the Minister of Water Affairs.

The event which no doubt increased the urgency for a decision to be made was a catastrophic sinkhole that occurred at West Driefontein on the 12th December 1962 with the loss of 29 lives,²⁸ which in the opinion of some, was directly related to the dewatering of the Oberholzer Compartment.

In view of the uncertainty that pervaded the area, the Minister of Water Affairs was obliged to summon the mines to a “Conference on Dolomitic Mine Water”, held on the 18th February, 1963. The decision of Government that “dewatering of the Oberholzer and Venterspost compartments should be adopted as a uniform policy by the mines”²⁹ no doubt, sealed the fate of all the dolomitic aquifers that were situated above gold bearing reefs. Dewatering of the Bank Compartment was sanctioned and commenced in 1969 prior to the issuing of the required Permit. The Permit to dewater the Gemsbokfontein Compartment was issued in 1986, the discharge of which was directed out of the catchment to the Vaal River via the Klein Rietspruit.³⁰ The area immediately affected by dewatering is nearly 500 km² in extent, where the sustained average volume of dolomitic water issuing from four fountains was 120 Ml/d.

3.5 THE VALUE OF WETLANDS IN WEST RAND DISTRICT MUNICIPALITY

As outlined in “What is a Wetland” above, wetlands provide innumerable goods and services to local communities and municipalities in the form of provisioning, regulatory, cultural and supporting

services. **Table 1** Wetland ecosystem goods and services identified in West Rand District Municipality. below outlines ecosystem services provided by wetlands in West Rand District Municipality.

TABLE 1 WETLAND ECOSYSTEM GOODS AND SERVICES IDENTIFIED IN WEST RAND DISTRICT MUNICIPALITY

Provisioning	
Food	Fish, fruits, grain (rice).
Fresh Water	Storage and retention of water; provision of water for drinking and irrigation.
Fibre and Fuel	Wood, reeds, peat.
Medicinal products	Medicinal plants, extraction of genes for resistance to pathogens.
Habitat	Habitat wild life and nesting sites for birds.
Regulating	
Climate regulation	Stores greenhouse gasses, influences local and regional temperature, precipitation.
Water regulation (hydrological flows)	They store storm water much like a sponge and slowly release it over time hence preventing sediment loss and over flooding of areas downstream.
Water purification and waste treatment	Retention, recovery and removal of excess nutrients and other pollutants.
Erosion control	Retain sediments.
Natural hazard regulation	Flood control and storm protection.
Pollination	Habitat and breeding ground for pollinators.
Cultural	
Spiritual	Baptism places, place of worship, collection of water for various religious activities.
Recreational	Opportunity for recreational and ecotourism, recreational fishing can create a considerable source of income.
Aesthetic	Beauty or aesthetic value in aspects of wetlands.
Educational	Opportunity for indigenous and academic research and learning.
Supporting	
Soil formation	Sediment retention and accumulation of organic matter, peat formation.
Nutrient cycling	Storage and recycling, processing and acquisition of nutrients.
Biodiversity	Habitat for resident and migrating species.

3.6 THREATS TO WETLANDS

Despite the huge benefits that wetlands provide in terms of ecosystem services, 50% of wetlands in South Africa have already been lost and 48% of the remaining wetlands are critically endangered and/or degraded.³¹ This loss is a direct result of deliberate draining of wetlands, development and expansion (both urban and agricultural) and pollution. Damage to wetlands results in increasingly limited functionality and subsequently a decrease in the ability to provide valuable ecosystem services.

Due to the mining activities in the area and the dolomite dominant geological character of the area, most of the natural wetlands are prevented from being saturated through dewatering activities. Following verbal communications with active stakeholders working in West Rand District Municipality, it became clear that the remaining wetlands located on areas not underlain by dolomite also face a significant number of threats all of which have the ability to either destroy the wetlands entirely or severely compromise functioning and provisioning of ecosystem services.

TABLE 2 KEY THREATS TO THE WETLANDS LOCATED WITHIN WEST RAND DISTRICT MUNICIPALITY

DRIVER	ACTIVITY	THREAT	POSSIBLE CAUSE
Land use	Zoning	Not adhering to the 32 m buffer zone.	Approval of development plans that infringe environmental legislation.
		Development approved within a wetland zone.	Economic development at an expense of environmental protection.
		Developer only meeting minimum requirements for EIA process.	Public not commenting during consultation processes.
		Lack of enforcement.	Lack of resources for site inspections.
	Infrastructure development	Encroachment.	Informal settlements in or near flood plains.
		Sewage pollution due to failing infrastructure.	Industrial areas less than 32 m from wetland buffer.
		Densification such as cluster development on a single Erf.	
	Land conversions	Deliberate drainage to make way for infrastructure.	Agricultural areas converted into residential and commercial zones.
		Removal of vegetation and hardening of surfaces.	Paving of streets increase rate and volume of storm water runoff.
	Agriculture and Mining	Deliberate drainage for expansion of production.	Deliberate drainage of Wonderfonteinspruit for mining.
		Unsustainable agricultural practices.	Excessive use of artificial fertilizers result in eutrophication.
			Removal of vegetation and cultivation result in sediment removal.

continued

3.6 THREATS TO WETLANDS *(continued)*

TABLE 2 KEY THREATS TO THE WETLANDS LOCATED WITHIN WEST RAND DISTRICT MUNICIPALITY

DRIVER	ACTIVITY	THREAT	POSSIBLE CAUSE
Land use	Agriculture and Mining	Unsustainable agricultural practices.	Over extraction of water for irrigation.
			Over exploitation.
	Industrialisation	Industrial discharges such as oils from industries. Industries releasing effluent containing oil and other pollutants.	Industrial areas less than 32 m from wetland buffer.
			Discharges rich in nutrients.
			Unauthorised discharges.
			High temperature effluent discharges.
			Polluted storm water runoff.
	Rapid urbanisation and high population growth	Encroachment. Litter. Lack of enforcement.	Need for human settlements.
Invasive species	Encroachment	Killing indigenous species.	Lack of enforcement of applicable legislation (NEMBA). Contusive environmental conditions.
Mining	Radiation	High water consumption.	
		Radiation impacts on vegetation.	
		Mine dump dust.	Dust is blown off dumps. Rain water percolates through unlined mine dumps.
		Mine water decant.	Radioactive water.
		Water discharged post operations.	
		Storm water.	
	Heavy metals	Heavy metals from mine voids dissolves.	Acidic water.
	Dewatering	Deliberate drainage of aquatic ecosystems.	Diversification of water to prevent percolation in mining shafts.

continued

3.6 THREATS TO WETLANDS *(continued)*

TABLE 2 KEY THREATS TO THE WETLANDS LOCATED WITHIN WEST RAND DISTRICT MUNICIPALITY

Pollution	Discharge	Mining – Predominantly Gold.	Industries discharges polluted water into the environment.
			Industries do not retain and treat their storm water prior to release in to the environment.
			Discharge from treatment plants and attenuation dams.
		Municipal water and sanitation departments – from waste water treatment plants.	Municipal waste water treatment plants discharges water that is reach in nutrients and causes eutrophication.
	Storm water runoff	Oils, debris, pesticides, herbicides.	Commercial and agricultural activities.
	Sediment	Sediment in wetlands.	Sediment interfere with wetland function.
Municipal governance	Knowledge base	Lack of benchmark and baseline data.	No monitoring and management inventory.
	Management systems	No management systems in place.	Physical management system with limited staff Internal affected and impacting department not communicating.
	Human resource	Capacity. No linkage between different municipal departments e.g. GIS, Disaster Management and Environmental Management.	Lack monitoring and enforcement No Grade 2 EMI designated by the minister for West Rand Lack of understanding of relevance between departments.
		Resources.	No budget for environmental conservation projects Cost of ecosystem services not quantified.
Education and Awareness	Lack of education and awareness of wetland services.	Municipalities concentrate on waste and water saving.	
		No educational material.	
		Not sufficient personnel.	
	Lack of financial and human resources.		

3.6 THREATS TO WETLANDS *(continued)*

3.6.1 Impact of mining on wetlands

Whilst mining plays a critical role in contributing to gross domestic product (GDP) and job creation, determining a balance between promoting developments and protecting the environment remains a contentious issue. Mining activities are characterized by land-use change and associated loss or degradation of natural habitats. The pressures placed on the environment and the remaining natural ecosystems as a result of historic and current mining activities are very high. Mining activities alter the functioning of wetlands and inflict regional loss of biodiversity and ecological productivity, because their water is often polluted and thus cannot support life. The sediments that are washed off from mining activities or mine residue deposits are often infertile and have high concentration of toxic elements. Section 48 of the Protected Areas Act prohibits mining in some areas, however mining houses can apply in

terms of the Water Act to dewater wetlands in order to prevent water ingress into mining compartments. From Donaldson Dam on the outskirts of Westonaria, a perennial water way was dewatered and a 1 m diameter pipeline was constructed over the mine compartments. This action killed the entire aquatic habitat in that area. The banks and water plants reduce impact of floods downstream, however the concrete pipe increases water volume.

Wetland soils are porous and absorb water during floods and therefore reduce the severity of flooding downstream. Wetlands are also natural water purifiers that trap suspended sediments and remove dissolved pollutants like nitrates, phosphates, and heavy metals, reduce nitrate and microbial values with great success and therefore play a pivotal role in the treatment of acid mine drainage.



FIGURE 17: Image depicting a small tributary where the water filtration capabilities of wetlands higher up in the catchment is illustrated. The brown water on the left has moved through a wetland that has been compromised by land use change whilst the clear water on the right has moved through a pristine wetland that has not been impacted by human activities.³²

3.6 THREATS TO WETLANDS *(continued)*

Abe Bailey Nature Reserve

Abe Bailey Nature Reserve is impacted directly by the mining activities through the deposition of treated mine water directly into the Wonderfonteinspruit freshwater ecosystem which then ends up in the Abe Bailey Wetland. This directly impacts the wetland ecosystem functioning and health. Despite the heavy amounts of pollution entering the system. However, the chemical composition of the water leaving the wetland in Abe Bailey Nature Reserve is much cleaner indicating that the wetland is removing a great deal of the toxic pollutants contained within the water entering the Nature Reserve. This highlights the services wetlands offer in West Rand district and emphasises their importance in sustainable

environmental management and overall human well-being in the West Rand District Municipality.³³

One major concern with the Abe Bailey Wetland is that due to the large volumes of water being continuously deposited into the system, the wetland has shifted from being a seasonal system to a perennial system which is almost permanently in a semi-flooding state. The wetland has also grown significantly in size. Khutsong informal settlement is situated in-between the two outer edges of the Abe Bailey Nature Reserve and due to the dolomite underlying the surface, West Rand District Municipality has great concern regarding the formation of sinkholes in the Khutsong community.

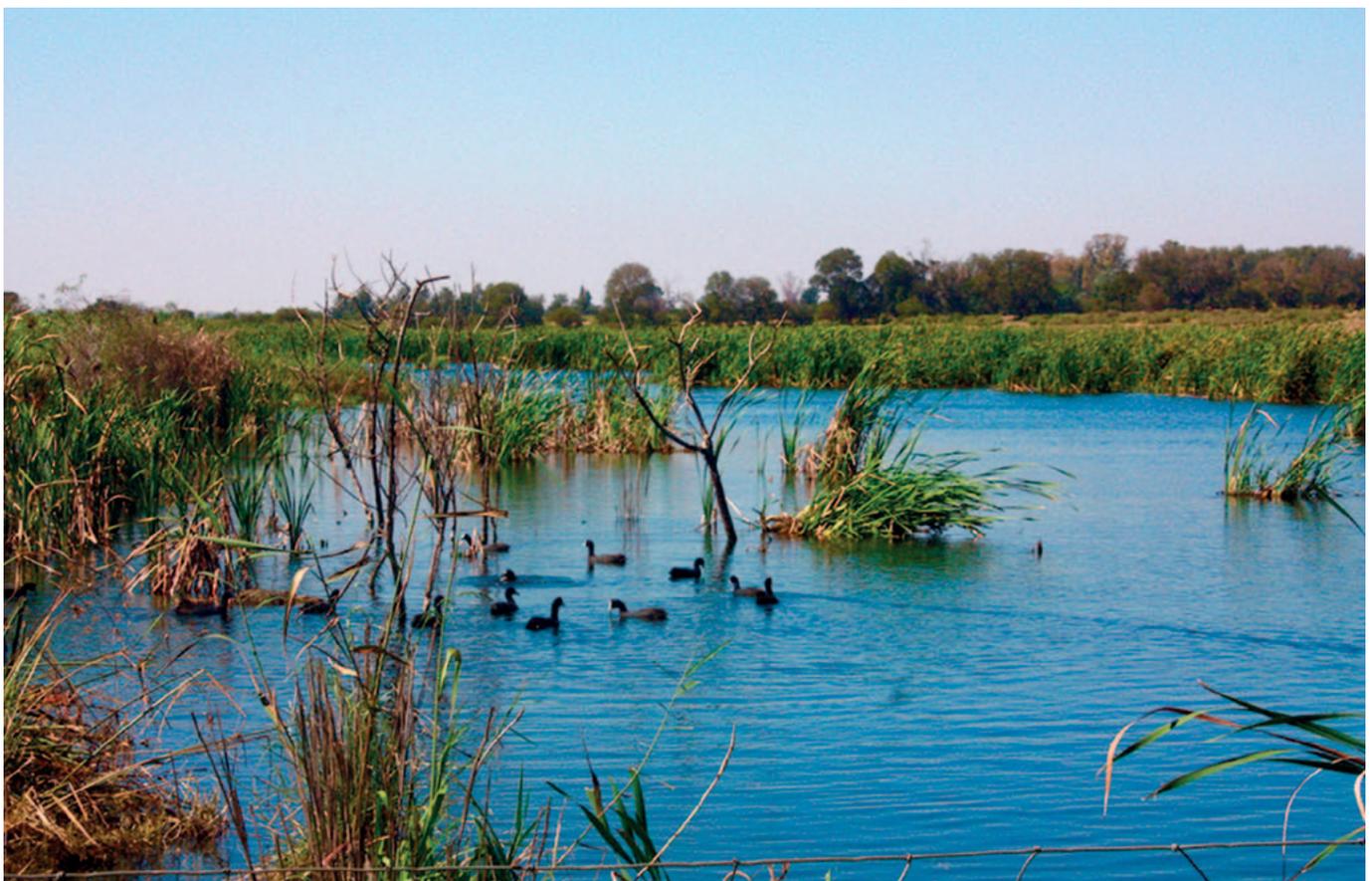


FIGURE 18: The Abe Bailey Nature Reserve.³⁴

3.6 THREATS TO WETLANDS *(continued)*

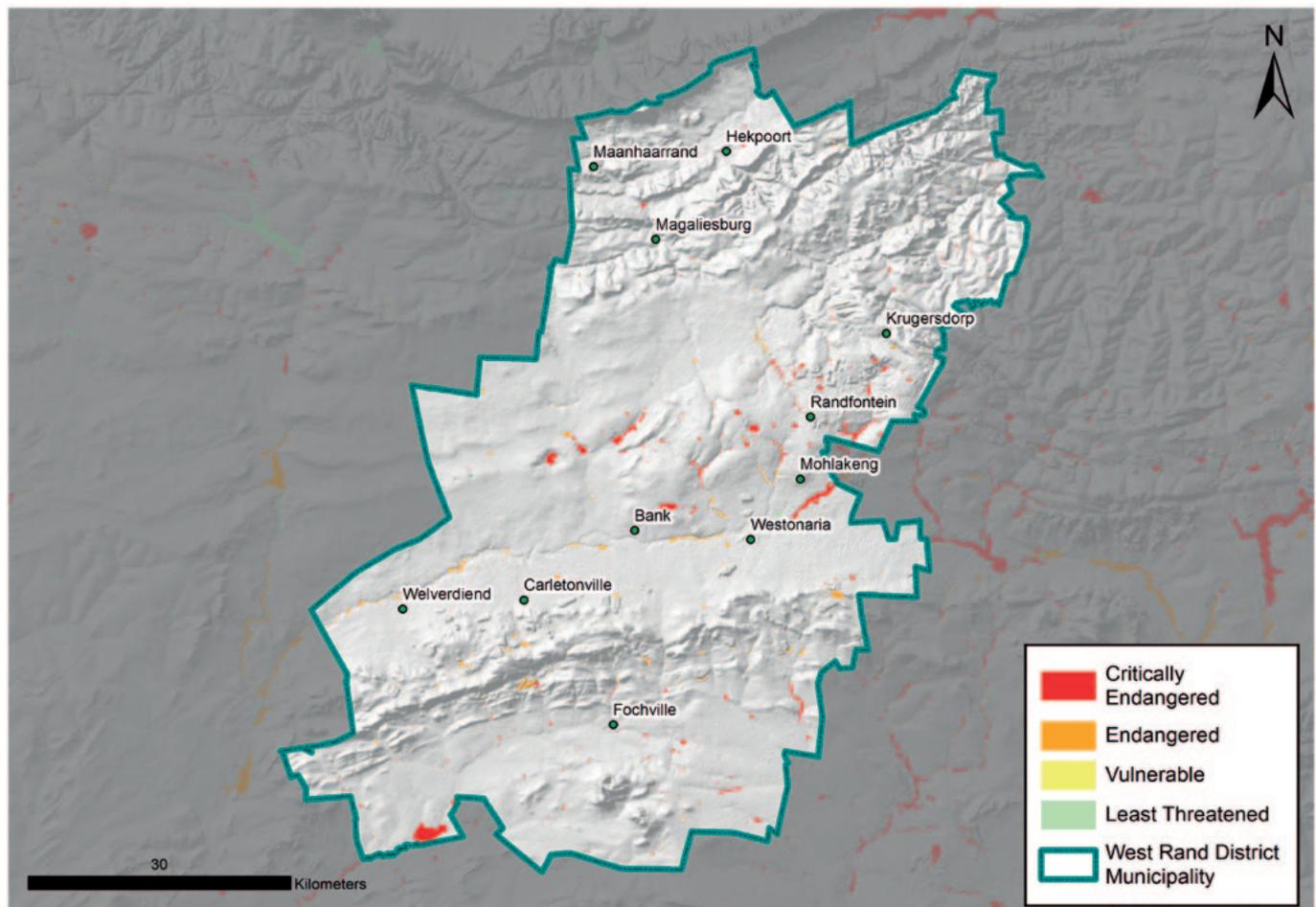


FIGURE 19: Map showing the health and threatened status of the Aquatic Ecosystems in West Rand District Municipality.

3.6.2 Rehabilitation of Wetlands in West Rand District Municipality

The value of wetlands and the ecosystem services they provide have been recognised by the multiple stakeholders working within the municipality and as such, efforts are being made to halt the loss of wetlands and rehabilitate those that have been damaged or

degraded with the purpose of restoring functionality and the subsequent provision of ecosystem services. Examples of stakeholders working within the area to rehabilitate wetlands include Abe Bailey Nature Reserve, the Department of Environmental Affairs: Working for Wetlands as well as the different mining groups.

3.7 WATER MANAGEMENT AREAS IN WEST RAND DISTRICT MUNICIPALITY

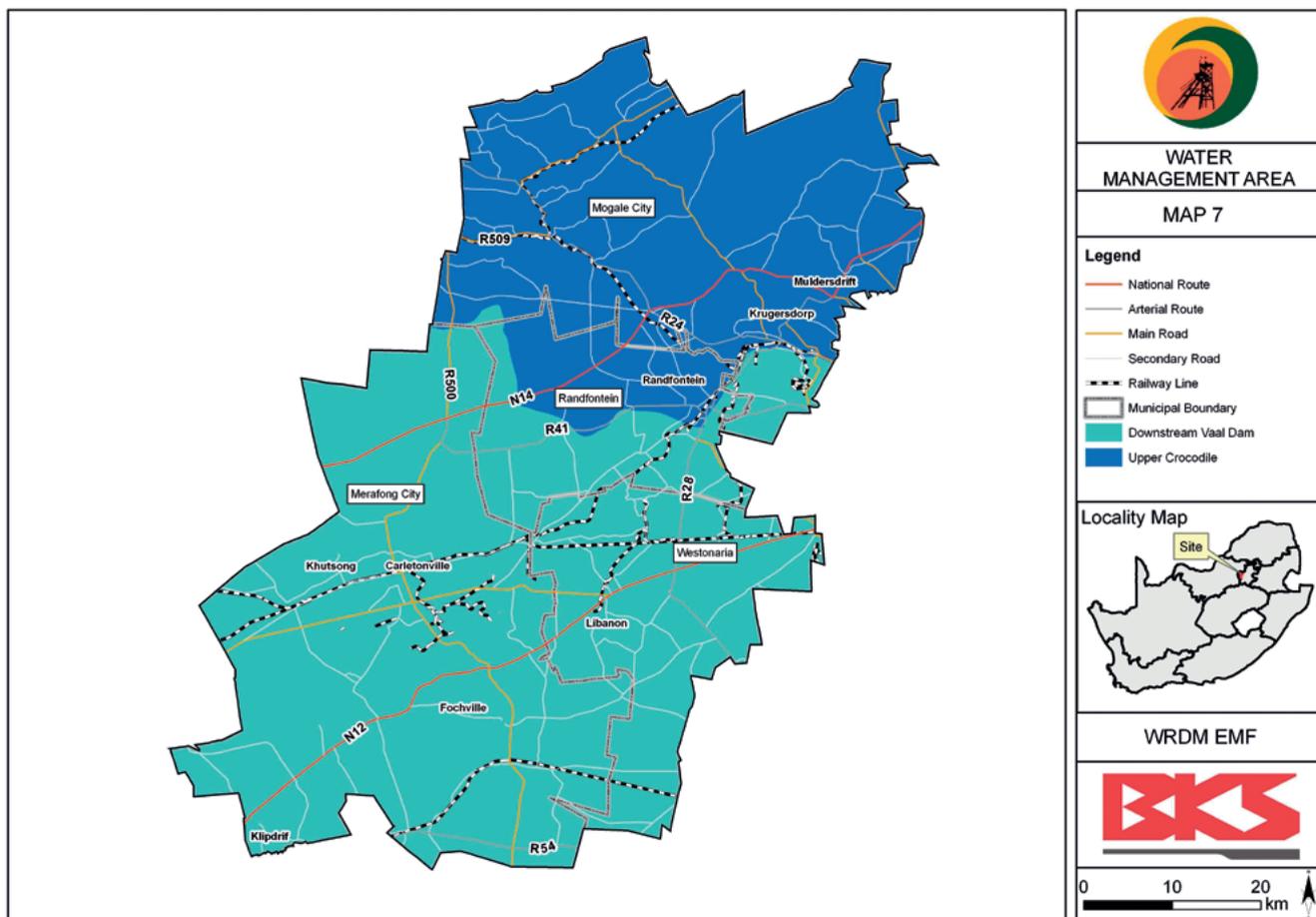


FIGURE 20: WMAs which lie within West Rand District Municipality.

South Africa is a water scarce country, which places severe limitation on the quantity of water available for consumption. In order to have a secure sustainable supply of water for everybody, water conservation and demand management measures must be placed on all water consumers. To better manage South Africa’s water resources, Water Management Areas (WMAs) have been delineated and these are managed by the Water Boards.

Two Water Management Areas are located within and just outside West Rand District Municipality namely the Upper Vaal WMA and the Crocodile (West) Maric WMA which are illustrated below.

The watershed between the two WMAs is in Rand West City Local Municipality divides this local municipality into a northern and southern section.

Several main river systems intersect West Rand District Municipality, namely, inter alia the Skeerpoort River, Blaauwbankspruit, Magalies River, Rietspruit, Crocodile River, Wonderfonteinspruit, Loopspruit and Leespruit.³⁵ The main threats to both of West Rand District Municipality’s WMA’s include climate change and agricultural and mining activities.

Domestic water in residential areas is provided by Rand Water, which generally abstracts water from outside West Rand District Municipality. Rand Water has only abstracted water from the Zuurbekom dolomitic compartment in the Westonaria Local Municipality, but since this water resource became depleted only outside resources have been used to abstract water for purification and supply to the district. The current availability of water within the catchments within West Rand District Municipality is not known.

4 | DISASTER MANAGEMENT AND CLIMATE CHANGE

“Disaster means a progressive or sudden, widespread or localised, natural or human-caused occurrence which is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.”

Disaster Management Act No. 57 of 2002

The National Disaster Management Act (Act No. 57 of 2002) stipulates that every Metropolitan and District Municipality within South Africa must establish and implement a framework for disaster management within the municipality. This is to ensure that each municipality takes responsibility

for hazard monitoring and risk mapping (“disaster risk assessment”), takes the necessary remedial steps to prevent and/or mitigate the occurrence or re-occurrence of disasters in their area of jurisdiction and that there is an integrated and uniform approach to disaster management.

4.1 DISASTER RISK MANAGEMENT IN WEST RAND DISTRICT MUNICIPALITY

4.1.1 Role of Wetlands in Disaster Risk Mitigation

As noted above wetlands are considered to be high-value ecological infrastructure as they provide a substantial number of ecosystem services to the surrounding local area as well as downstream. Wetlands also have the ability to buffer and reduce the

impacts of a substantial array of disasters including flooding, drought, inconsistent water supply, soil erosion, loss of biodiversity and groundwater pollution. Wetlands can play a key role in disaster risk mitigation within the district. This is summarised in

Table 3 below:

TABLE 3 ROLE OF WETLANDS IN DISASTER RISK MITIGATION IN WEST RAND DISTRICT MUNICIPALITY

DISASTER	ROLE OF WETLANDS IS DISASTER RISK MITIGATION ³⁶
Flooding	Wetlands have the ability to reduce the velocity of flowing water and absorb some of the water into the wetland system. As such, rather than the flood water moving through the system at once, water is retained and released at a slower rate. This means that not only is the intensity of the flood reduced or prevented all together, thereby reducing the potential impact on infrastructure and housing downstream, but there is sustained water flow long after the rainfall event.
Inconsistent Water Flow & Drought	Wetlands have the ability to act like sponges in that throughout the rainy season they absorb water. During the dry season, and even in times of drought, this water is slowly released thereby ensuring that rivers and streams maintain sustainable flows and supply continuous water despite lack of rainfall.
Groundwater Pollution	Wetlands have the ability to purify water by trapping pollutants, sediments, excess nutrients (especially nitrogen and phosphorus), heavy metals, disease-causing bacteria and viruses, and synthesized organic pollutants such as pesticides, thereby ensuring that the water leaving the wetland is cleaner than the water that entered it.

continued

4.1 DISASTER RISK MANAGEMENT IN WEST RAND DISTRICT MUNICIPALITY *(continued)*

TABLE 3 ROLE OF WETLANDS IN DISASTER RISK MITIGATION IN WEST RAND DISTRICT MUNICIPALITY

DISASTER	ROLE OF WETLANDS IS DISASTER RISK MITIGATION
Loss of Biodiversity	Wetlands can be considered as biodiversity hotspots in themselves as they provide key habitat to a number of plant and animal species. Often these species are considered to be unique and are completely dependent on the system. Maintaining healthy wetlands can therefore contribute to halting loss of biodiversity within the municipality.
Soil Erosion	Due to the fact that wetlands are covered by specially adapted vegetation, little to no erosion occurs in wetland areas as the wetland plants have the ability to stabilise and bind the soil, reducing the risk of top soil loss downstream.

4.2 CLIMATE CHANGE AND WETLANDS IN WEST RAND DISTRICT MUNICIPALITY

‘Climate change’ means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

United Nations Framework Convention on Climate Change (UNFCCC)

In simpler terms, climate change can best be described as a long term change in the Earth’s global climate patterns including shifts in historical seasonality, rainfall patterns and average temperature ranges. These shifts are caused by an increase in global temperatures which are caused by increasing greenhouse gases (e.g. carbon dioxide) being emitted into the atmosphere. The raising of greenhouse gas levels in the atmosphere is caused by large scale human activities including but not limited to industry, agriculture, transport and land use change. As a result, the long term historical climate trend is shifting towards unstable and unpredictable future climate conditions.

4.2.1 Historical Climate in West Rand District Municipality

West Rand falls in the Highveld region of the Gauteng Province and experiences typical Highveld climate conditions:

- Summer months are warm to hot and are from November to February.
- Winter months are moderate to cool and are from June to August.
- Average maximum temperatures occur during the late summer months (Jan and Feb).
- Moderate temperature variation between winter and summer months.

4.2 CLIMATE CHANGE AND WETLANDS IN WEST RAND DISTRICT MUNICIPALITY *(continued)*

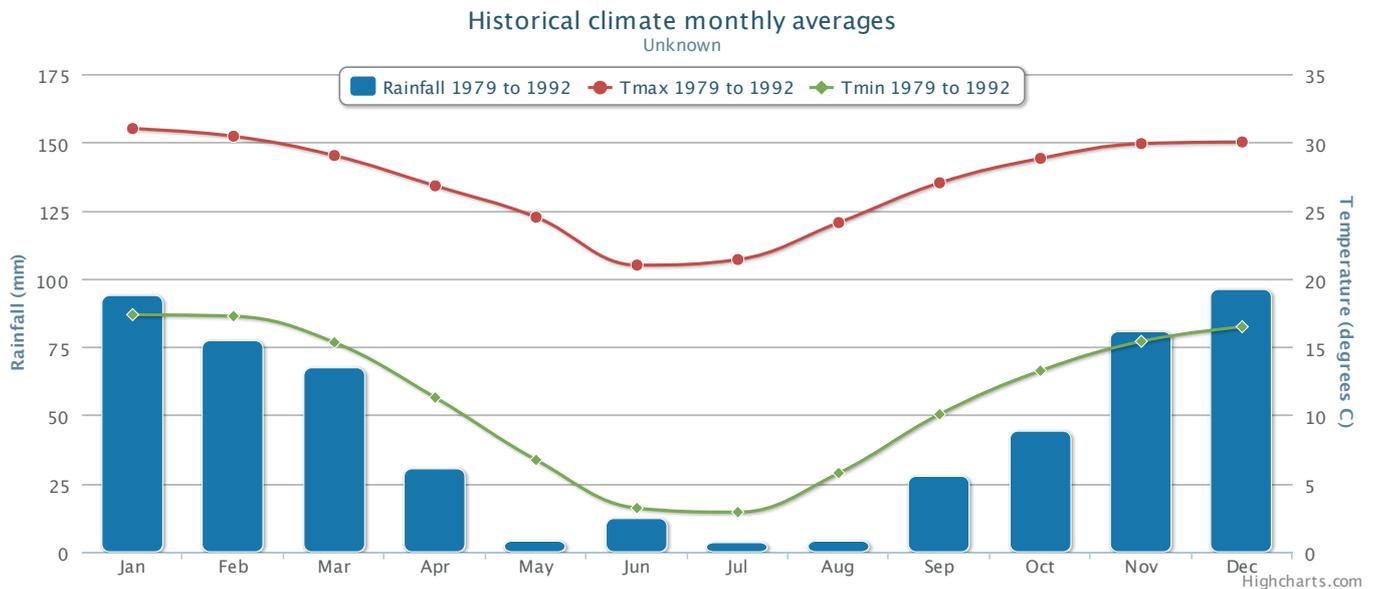


FIGURE 21: Graph depicting the typical climate of West Rand District Municipality.³⁷

West Rand experiences high rainfall in the summer months. Most of the annual rainfall falls between November and March with the highest amount of rainfall falling between December and January. Little to no rainfall occurs during the winter months (June-August). Historically, West Rand District Municipality has been subject to cycles of prolonged drought, lasting for several years at a time. Extreme weather events are extremely rare, however may start to increase due to climate change.

4.2.2 Projected Climate Change in West Rand District Municipality

The Climate Systems Analysis Group (CSAG) from the University of Cape Town (UCT) has developed the Climate Information Platform (CIP) which seeks to provide climate related information at downscaled levels. The CIP runs a series of climate models which collectively provide a database of historical climate patterns as well as future projections for regions and districts throughout the world.

Temperature:

Models all agree that a general warming will definitely occur. There will be a definite increase (red) in average monthly temperatures throughout the year. Overall

increase in monthly average temperatures will most likely be between 1.5–2.5 degrees Celsius. Summer temperatures will increase slightly more than the winter temperatures. The summer maximum temperature range will increase slightly more than the minimum temperature range with an associated increased risk of heat waves.

Rainfall:

Change in the overall rainfall patterns will definitely occur. Overall no consistent indication on the direction of change. Despite uncertainty however, models generally indicate that there will be a shift to generally drier conditions overall, particularly in the winter months. Models also indicate that there will be a shift in timing of seasonal rainfall as well as a shift in the rainfall patterns. Rainfall quantity is likely to remain the same or decrease overall however there could be an increase in the frequency and intensity of rainfall events during the summer months. It is anticipated that there will be an exacerbation of the existing climate conditions.

4.2 CLIMATE CHANGE AND WETLANDS IN WEST RAND DISTRICT MUNICIPALITY *(continued)*

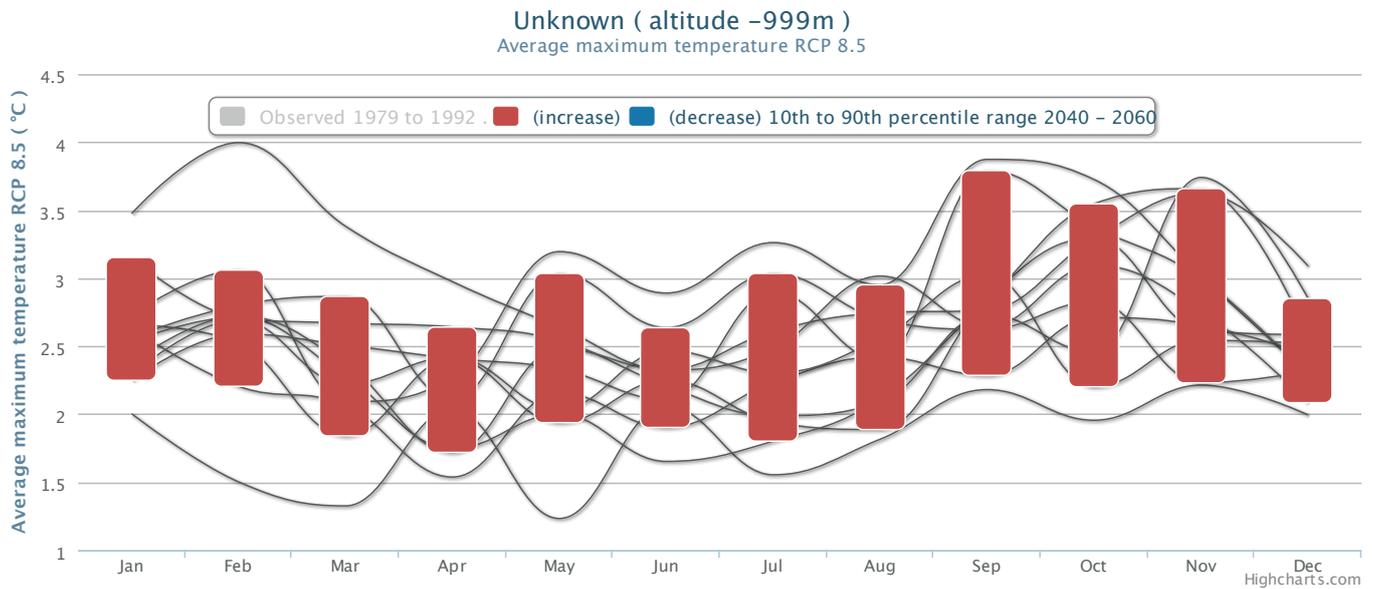


FIGURE 22: Graph depicting the anticipated changes in average maximum temperature patterns for West Rand District Municipality.³⁸

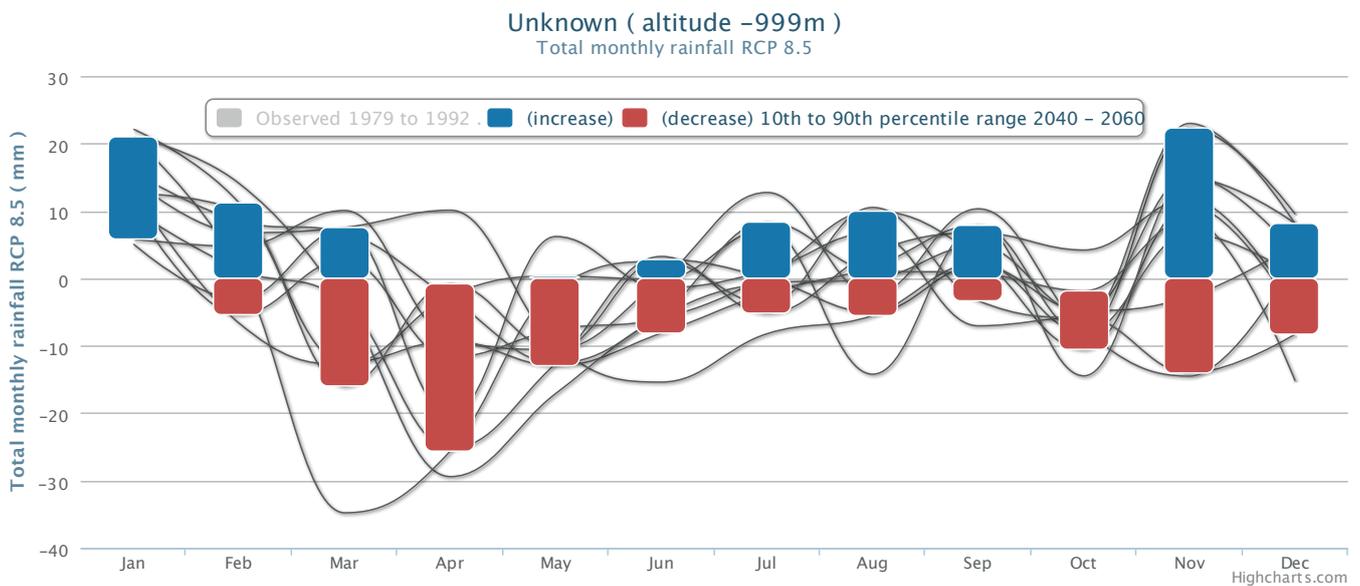


FIGURE 23: Graph depicting the anticipated changes in total monthly rainfall patterns within West Rand District Municipality.³⁹

4.2 CLIMATE CHANGE AND WETLANDS IN WEST RAND DISTRICT MUNICIPALITY *(continued)*

4.2.3 Impacts of Climate Change in West Rand District Municipality

A shifting climate means that the historical seasonality and rainfall and temperature patterns no longer apply. Increasing monthly temperatures and uncertain rainfall patterns combined with the increased duration of hot and dry spells between rainy seasons results in an increased risk of more severe exacerbated dry periods and drought. Increasing uncertainty of rainfall patterns and the number of the associated wet days could result in either general drying or exacerbated drought conditions; or could result in an increase in the magnitude and frequency of rainfall events resulting in an increased risk of periodic flooding in the summer months.

The predicted increase in temperature will result in, on average, hotter days throughout the year, as well as an increased likelihood of hot spells and heat waves occurring more frequently in the summer months. The uncertain changes in rainfall patterns mean that resulting impacts could go one of two ways. Should there be an increase in annual rainfall, there will also most likely be an increase in the magnitude and frequency of storm events (i.e. more severe storms happening more often) resulting in an increased number of annual flooding incidents (and very likely increased severity), particularly in the winter months. Should there be a decrease in rainfall however, there will be an increased number of annual dry days resulting in subsequent increased risk of water scarcity and drought as well as more intense fires occurring throughout the district.

4.2.4 Role of Wetlands in Mitigating the Impacts of Climate Change

The projected changes in climate will impact wetlands. The most pronounced effect of climate change on wetlands will be through the alteration in changes in flow patterns and decrease in wetland size. A loss in wetlands will cause a reduction in ecosystem services as well as loss of habitat important to a variety of animal and plant species, particularly migratory birds.

Healthy wetlands have a high resilience to climate change impacts, which means that they are able

to maintain their capabilities to supply ecosystem services. Wetlands which are in poor condition are more vulnerable because their ability to respond and adapt to the change in climate is reduced (i.e. if wetlands are in poor condition then they cannot provide the ecosystem services that are required).

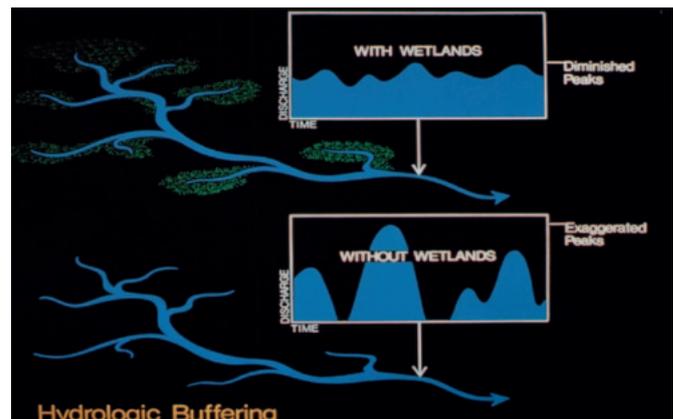


FIGURE 24: Schematic representation on the hydrological buffering capability of wetlands.

Maintaining and or rehabilitating wetland systems is therefore vitally important to reduce risk to climate change impacts. Ecosystem-based adaptation options which could be used to reduce the impact of climate change on wetlands and enhance their ecosystem service delivery include:

- Improved management strategies and cooperative approaches to innovative solutions;
- Removal and or control of polluting agents and sources; and
- Proactive wetland rehabilitation.

Wetlands occur extensively across West Rand District Municipality. Investing in the maintenance of healthy wetlands and the rehabilitation and restoration of damaged or degraded wetlands can ensure that wetlands perform their ecosystem services to the maximum of their capabilities. This will also assist West Rand District Municipality with reducing climate change impacts in the district and increase both wetland systems as well as the district's resilience to the impacts of climate change.

5 | GOVERNANCE & MANAGEMENT

South Africa has an extensive legislative framework concerning the environment and biodiversity, which are considered in both developmental planning as well as national government priorities. This section

outlines key legislation and policies as well as the governance structure within West Rand District Municipality which leads to the current wetland management strategy within the district.

5.1 POLICY FRAMEWORK

Table 4 Legislation governing wetland management in West Rand District Municipality. below provides a comprehensive summary of all South African legislation, policies and strategies pertinent for the management of wetlands within West Rand District Municipality. It is important to note that

some of the legislation such as the National Environmental Management Act provides specific instructions regarding wetland management whilst other legislation indirectly supports management of wetlands such as the National Environmental Management: Waste Act.

TABLE 4 LEGISLATION GOVERNING WETLAND MANAGEMENT IN WEST RAND DISTRICT MUNICIPALITY

LEGISLATION/ POLICY/ STRATEGY	HOW IT RELATES TO WETLANDS
Legislation	
South African Constitution	Overarching principles of care for the environment.
Environmental Conservation Act and associated By-Laws	Controls access to and activities within coastal and wetland areas.
National Water Act	Water use control, including extraction and construction within the vicinity of a watercourse or wetland.
National Environmental Management Act	Environmental impact assessments (EIAs) for the development of a new or disturbed site within the vicinity of a watercourse or wetland.
National Environmental Management: Biodiversity Act	Protection of biodiversity and the formulation of a number of tools (e.g. bioregional plans and threatened ecosystem lists) that feed into land use planning and EIA procedures.
National Environmental Management: Biodiversity Act - Alien and Invasive Species Regulations	All matters related to invasive species management (both fauna and flora).
National Environmental Management: Integrated Coastal Management Act	Protection of coastal landscapes and sensitive areas, which often include wetlands.
National Environmental Management: Protected Areas Act	Protection of national parks, protected areas and conservation sites. This includes the protection of wetland site.
National Environmental Management: Waste Act	Regulation of illegal dumping.
Conservation of Agricultural Resources Act	Protect the utilization of the natural agricultural resources to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invasive plants.

continued

5.1 POLICY FRAMEWORK *(continued)*

TABLE 4 LEGISLATION GOVERNING WETLAND MANAGEMENT IN WEST RAND DISTRICT MUNICIPALITY

LEGISLATION/ POLICY/ STRATEGY	HOW IT RELATES TO WETLANDS
Municipal Structures Act	Promotion of regional planning and spatial planning categories.
Municipal Health Act	Monitoring of WWTW discharge.
Policies	
National Development Plan, and associated Medium Term Strategic Framework (MTSF)	Sets out measures to protect natural resources in South Africa. Through the creation of the MTSF and associated 'Delivery Agreements', required outputs and targets are set.
Municipal Planning	
Integrated Development Plan (IDP)	Overall strategy document for the municipality.
Provincial Strategic Development Framework (SDF)	Overarching spatial planning guidelines for the province.
District SDF	Broad spatial planning guidelines for the district (including a map of land use within the district).
Local Municipal SDFs	Strategic plans to manage municipal land at the local level.
Open Space Framework	Demarcation of Open Space Areas.
Environmental Management Framework	Map and land use guidelines for areas of environmental importance.
Sector Plans	This includes the Disaster Management Plan.
Strategies	
The National Biodiversity Framework	Provides biodiversity targets for South Africa.
National Water Resource Strategy	Speaks to protection and rehabilitation of wetlands.
Other	
Bioregional plans (draft or gazetted)	Maps Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs).
Spatial Planning and Land Use Management Act (SPLUMA)	Provides a framework for spatial planning and land use management in South Africa. It also stipulates that municipal planning is primarily the executive function of the local sphere of government and requires that biodiversity is adequately considered in spatial planning.
Disaster Management Amendment Bill	Outlines how ecosystems should be considered in the updated Disaster Management Act.

Taking the above legislation into account, the strategic objectives for West Rand District Municipality as per the IDP are currently as follows:

- To ensure the health and safety of all in West

Rand District Municipality through the provision of efficient basic services and infrastructure in terms of disaster management, municipal health and environmental management.

5.1 POLICY FRAMEWORK *(continued)*

- To promote local economic development by supporting initiatives in the district for the development of a sustainable district economy.
- To ensure good governance practices by providing democratic and pro-government and ensuring community participation.
- To ensure municipal transformation and institutional development by creating a staff structure that would adhere to the principles of employment equity and promote skills development.
- To attain and maintain financial viability and sustainability by executing accounting services in accordance with National policy and guidelines.

5.2 WETLAND MANAGEMENT IN WEST RAND DISTRICT MUNICIPALITY

Currently there is no specific designated wetland management authority or wetland management capacity within West Rand District Municipality. Instead, the management of wetlands is a collective effort between the Environmental Management, Fire and Disaster Management, Municipal Health Services, Urban Planning and Water and Sanitation

Departments, each of which manage wetlands through their own key mandates and legislative requirements. The local municipalities within West Rand District Municipality also play a role in wetland management.⁴⁰ In 2006, West Rand District Municipality released their first Environmental Management Framework (EMF) (Revision 1) for the district area.⁴¹

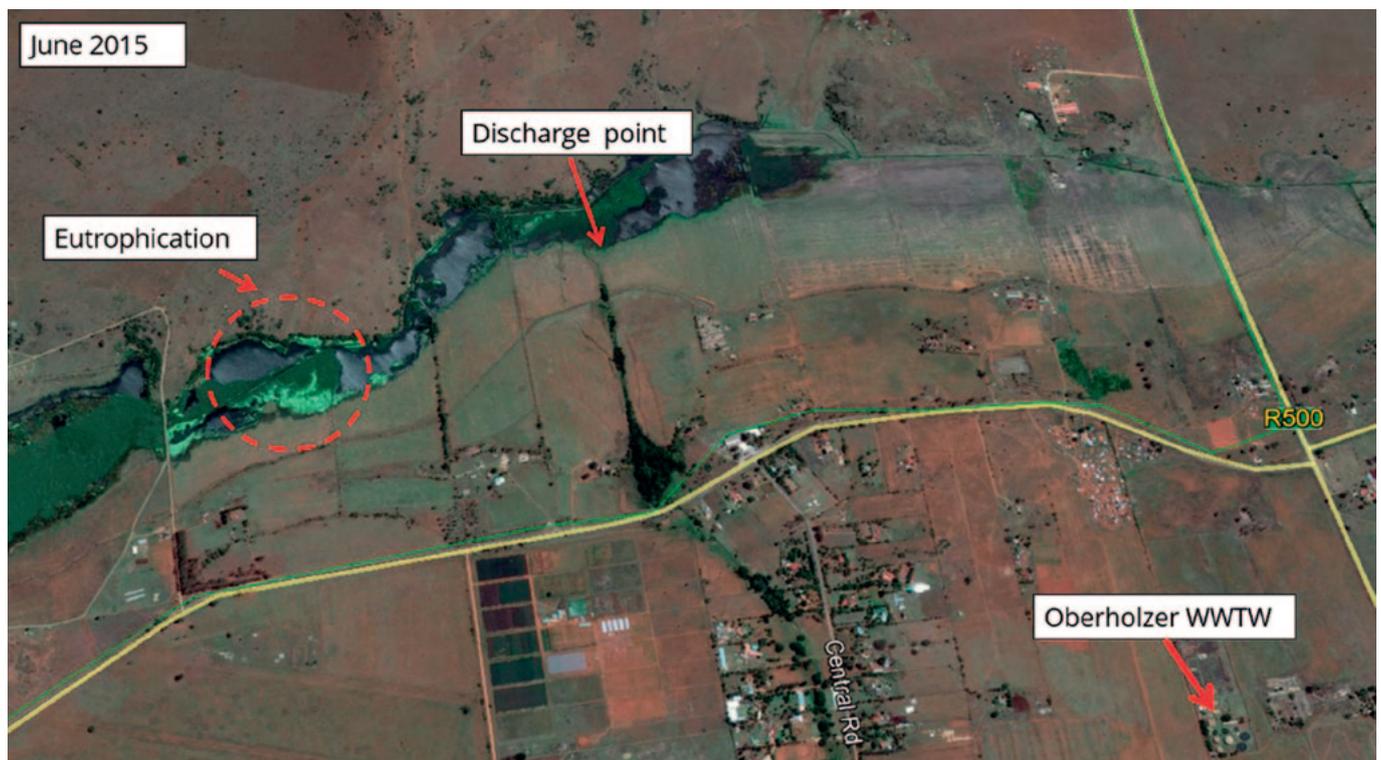


FIGURE 25: Waste Water Treatment Works impact on the wetland system north of the Oberholzer WWTW.

5.2 WETLAND MANAGEMENT IN WEST RAND DISTRICT MUNICIPALITY *(continued)*

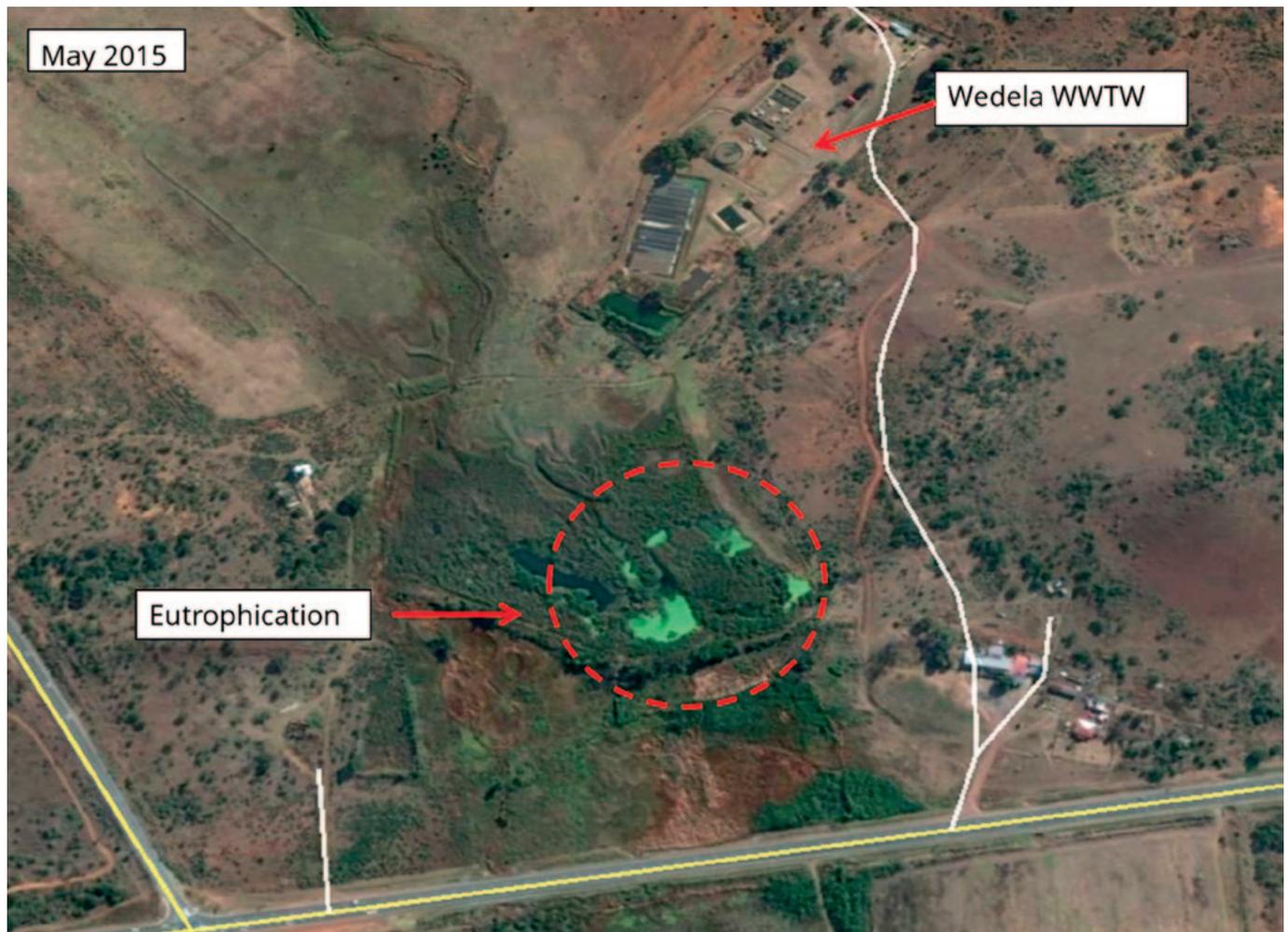


FIGURE 26: Waste Water Treatment Works impact on the wetland system below the Wedela WWTW.

5.2.1 Environmental Management Framework (EMF)

In February 2010, West Rand District Municipality appointed BKS (Pty) Ltd to review and update this EMF in order to bring the EMF in line with the 2010 EMF Regulations. This EMF is important as the WRDM is experiencing immense pressure between mining, agriculture and tourism and which is having an impact on biodiversity, heritage, air quality, agricultural potential, mineral reserves, water availability and quality, and geological constraints of the area.

The EMF highlights external pressures, emanating from mining, agricultural and industrial activities on

the West Rand which are major contributing factors to the current state of surface and ground water quality in the region. Acid mine drainage impacts on the West Rand must be one of the most publicised environmental impacts in South Africa. Equally as detrimental to the water resources within the region are the impacts from ill managed, under capacitated waste water treatment works and the lack of sanitation services in informal settlement areas.

Above are two examples of how Waste Water Treatment Works (WWTW) can impact wetlands in West Rand District Municipality.

6 | LOCAL AND REGIONAL PARTNERSHIPS AND PROGRAMMES

Across South Africa, many stakeholders are engaged in wetland management and conservation. It has long been recognised that working with or aligning with these stakeholders can have a catalytic impact by building on these endeavours and simultaneously supporting the work of the municipality (and vice versa). Partners frequently bring additional and much needed resources in terms of staff capacity, budget, knowledge etc. It is therefore imperative that all stakeholders remain connected and their individual work undertaken recognised to create opportunities for synergies and future alignment.

In addition to the collective municipal work that is being undertaken at both the district and local level to monitor and manage wetlands within West Rand District Municipality, there are numerous projects and activities currently being implemented within and around wetlands by the public and private sector as well as several NGOs. Some of the projects currently underway within West Rand District Municipality are summarised in **Table 5** below:

TABLE 5 LOCAL AND REGIONAL WETLAND RELATED PARTNERSHIPS AND PROGRAMMES WITHIN WEST RAND DISTRICT MUNICIPALITY

PROJECT NAME	PROJECT DESCRIPTION	PROJECT IMPLEMENTING ENTITY	ADDITIONAL STAKEHOLDERS
SANParks Honorary Ranger birding weekends	Sasol is one of the role players in the conservation of indigenous wildlife, and has partnered with BirdLife South Africa and SANParks Honorary Rangers: West Rand Region to support bird conservation through the SANParks Honorary Ranger birding weekends, which allow birders to contribute to 'citizen science' by recording the threatened birds they sight on their game drives.	SANParks Honorary Rangers: West Rand Region	Sasol, BirdLife South Africa and
Rand Water Wetlands	Rehabilitating the Happy Acres wetland in Magaliesburg	Mogale City Local Municipality	

7 | COMMUNICATION AND PUBLIC AWARENESS

Communication, education and public awareness (CEPA) plays an essential role in gaining the cooperation and collaboration of individuals and organizations in the public, political and economic

sectors to act to reduce wetland loss and degradation. This section details the current activities that the municipality engages in for raising awareness and educating the community at large.

7.1 COMMUNICATION AND EDUCATION

At this stage, West Rand District Municipality does not have any district specific environmental awareness campaigns being implemented with either officials or the public. There are also no municipal environmental tools available for educational purposes at this stage.⁴²

Water Wise and Rand Water do however have an online wetland rehabilitation posters available intended to promote education regarding the importance of wetlands and the rehabilitation of wetlands.⁴³

7.2 PUBLIC PARTICIPATION AND AWARENESS

Strategic documents such as the IDP, SDF and EMF are reviewed and updated regularly. Formal public participation processes are followed whenever these

documents are updated to ensure that the public has ample opportunity to submit comments and engage with the municipality.



FIGURE 27: Anton Listrom undertaking municipal level awareness raising on the value of wetlands for local communities living in rural areas.

CONCLUSION

The aim of the West Rand Wetland Report was to bring together all the available wetland related information for West Rand District Municipality as well as highlight gaps in knowledge and where wetland management within the municipality could be strengthened going forward.

Through an extensive desktop study, as well as multiple bi-lateral meetings with stakeholders working within West Rand District Municipality, it was found that the district has a huge wealth of wetlands including one particularly important system namely the Wonderfonteinspruit and its Abe Bailey wetland. The wetlands within the municipality not only provide a wide range of ecosystem services including flood attenuation, water storage, water filtration and food provision but also provide key habitat for a number of rare and critically endangered flora and fauna. The wetlands within the municipality also play a pivotal role in reducing the impacts of climate change as well as disaster risk management within the district.

The wetlands within West Rand District Municipality however, are currently under threat from encroachment, flow system modifications as well as chemical, mining, stormwater and polluted waste water treatment discharge into the wetlands. This puts the municipality at risk from losing the valuable ecosystem services the wetlands provide.

In terms of wetland management, it was found that other than the SANBI BGIS NFEPA data, there is currently no formal ground-truthed wetland spatial data for the district, clearly depicting where the wetlands are located within the landscape. This makes development planning around wetlands extremely challenging. As such, it would be useful to develop a ground-truthed wetland map which not only highlights where wetlands are on the ground but also indicates their status (i.e. pristine condition or degraded) as this would assist town planners, mines and farmers with future planning of developments, expansion and or redevelopment.

Additionally, at the time of reporting it was found that there was no specific department within West Rand District Municipality which directly deals with the management of wetlands within the landscape. Instead separate municipal departments including the Environmental Management, Fire and Disaster Management and Water and Sanitation Departments all manage wetlands as per their own legislative requirements. Due to capacity constraints and the tendency of these separate municipal departments to work "in silos", there is currently very little communication or cohesion across the separate departments dealing with issues or concerns pertaining to the wetlands, making the holistic management of wetlands within the district a difficult task and also increasing the risk of wetland degradation. Thus, in order to strengthen wetland management, prevent further loss of and/damage to wetlands and ensure the continued provision of valuable ecosystem services to the municipality, a holistic management approach is recommended where wetlands are addressed specifically by one department. Alternatively, a platform could be developed where information can be easily shared and maintenance/rehabilitation actions are allocated and taken forward. It would also be useful to work with key external stakeholders such as developers, mines and scientists to ensure cohesion between projects and information available on wetlands across the district.

Finally, it was found that West Rand District Municipality currently does not have any environmental or education strategies surrounding wetlands and as such no wetland education is currently being implemented into schools or within the local municipalities. Developing a wetland awareness education tool for the municipality would be useful to ensure ongoing wetland education and awareness raising is implemented throughout the municipality.

DEFINITIONS

Biodiversity ⁴⁴	The variability among living organisms from all sources, including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.
Climate Change ⁴⁵	Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.
Critical Biodiversity Areas ⁴⁶	CBAs incorporate: (i) areas that need to be safeguarded in order to meet national biodiversity thresholds (ii) areas required to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or (iii) important locations for biodiversity features or rare species.
Disaster ⁴⁷	Disaster means a progressive or sudden, widespread or localised, natural or human-caused occurrence which is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.
Disaster Management ⁴⁸	Disaster Management means a continuous and integrated multi-sectoral, multi-disciplinary process of planning and implementation of measures to prevent or reduce the risk of disasters; mitigate the severity or consequences of disasters; emergency preparedness; a rapid and effective response to disasters; and post-disaster recovery and rehabilitation. It is the systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster. Disaster Management aims to avoid, lessen or transfer the adverse effects of hazards through activities and measures for prevention, mitigation and preparedness.
Ecosystem services	This is the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth.
Wetland ⁴⁹	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.

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Kathy Taggart at **Natural Scientific Services**, for providing information on the planned wetland management plans of the mines, and general information on wetland management in West Rand.

Christiaan de Jager at **Merafong Local Municipality**, for providing detailed information on planning and development regarding urban wetlands in West Rand.

Japie Buckle of **Department of Environmental Affairs** for providing detailed information on wetlands, wetland ecosystem services and threats to wetlands.

Mbali Kubheka of the **Department of Environmental Affairs: Working for Wetlands Programme** for providing basic wetland information as well as photographs of wetlands, distinctive wetland (mottled) soils and key wetland vegetation.

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ANNEXURE 1

ANNEXURE 1

LIST OF KEY FAUNA AND FLORA IN NEED OF CONSERVATION IN WEST RAND DISTRICT MUNICIPALITY

TYPE	NAME	REASON FOR CONCERN
Plants	<i>Aloe peglerae</i>	Endangered
	<i>Habenaria mossii</i> ,	
	<i>Lithops lesliei</i> subsp. <i>lesliei</i> var. <i>rubrobrunnea</i>	
	<i>Bowiea volubilis</i> subsp. <i>volubilis</i> ,	Vulnerable
	<i>Brachycorythis conica</i> subsp. <i>transvaalensis</i>	
	<i>Cheilanthes deltoidea</i> subsp. nov. <i>Gauteng form</i>	
	<i>Cineraria longipes</i>	
	<i>Dioscorea sylvatica</i>	
	<i>Khadia beswickii</i>	
	<i>Ledebouria atrobrunnea</i>	
	<i>Melolobium subspicatum</i>	
	<i>Prunus africana</i>	
	<i>Adromischus umbraticola</i> subsp. <i>umbraticola</i>	
	<i>Boophane disticha</i>	
	<i>Callilepis leptophylla</i>	
	<i>Cineraria austrotransvaalensis</i>	
	<i>Cleome conrathii</i>	
	<i>Delosperma leendertziae</i>	
	<i>Dioscorea sylvatica</i>	
	<i>Drimia sanguine</i>	
	<i>Frithia pulchra</i>	
	<i>Gnaphalium nelsonii</i>	
	<i>Gunnera perpensa</i> ,	
	<i>Habenaria barbertoni</i>	
	<i>Habenaria kraenzliniana</i>	
	<i>Holothrix randii</i>	
	<i>Hypoxis hemerocallidea</i>	
	<i>Ilex mitis</i> var. <i>mitis</i>	
	<i>Kniphofia typhoides</i>	
	<i>Stenostelma umbelluliferum</i>	
<i>Trachyandra erythrorrhiza</i>		

continued

ANNEXURE 1 *(continued)*

ANNEXURE 1

LIST OF KEY FAUNA AND FLORA IN NEED OF CONSERVATION IN WEST RAND DISTRICT MUNICIPALITY

TYPE	NAME	REASON FOR CONCERN
Mammals	<i>Mystromys albicaudatus</i> (White-tailed mouse)	Endangered
	<i>Rhinolophus blasii</i> (Blasius'/Peak-saddle horseshoe bat)	Vulnerable
	<i>Atelerix frontalis</i> (Southern African hedgehog)	Near-threatened
	<i>Lutra maculicollis</i> (Spotted-necked otter)	
	<i>Rhinolophus clivosus</i> (Geoffroy's Horseshoe Bat)	
	<i>Rhinolophus hildebrandtii</i> (Hildebrandt's Horseshoe bat)	
	<i>Miniopterus schreibersii</i> (Schreiber's long-fingered bat)	
<i>Myotis tricolor</i> (Temminck's Hairy bat)		
Birds	Wetland-dependent (full or partial): <i>Podica senegalensis</i> (African Finfoot) <i>Tyto capensis</i> (African Grass Owl) <i>Circus ranivorus</i> (African marsh Harrier) <i>Gorsachius leuconotus</i> (White-backed Night Heron)	Vulnerable
	Non-wetland dependent: <i>Eupodotis senegalensis</i> (White-bellied Korhaan)	
	<i>Anthropoides paradiseus</i> (Blue Crane)	
	<i>Falco naumanii</i> (Lesser Kestrel)	
	<i>Polemaetus bellicosus</i> (Martial Eagle)	
	<i>Gyps coprotheres</i> (Cape Vulture)	
	<i>Sagittarius serpentarius</i> (Secretary Bird)	
	<i>Mirafria cheniana</i> (Melodius Lark)	Near-threatened
	<i>Falco biarmicus</i> (Lanner Falcon)	
	<i>Phoenicopterus minor</i> (Lesser Flamingo)	
	<i>Phoenicopterus ruber</i> (Greater Flamingo)	
	<i>Rostratula benghalensis</i> (Greater Painted Snipe)	
	<i>Alcedo semitorquata</i> (Half-collared Kingfisher)	

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