

# Waterberg District Environmental Management Framework Report

## EXECUTIVE SUMMARY

### INTRODUCTION

The Environmental Management Framework (EMF) is an initiative of the national Department of Environmental Affairs (DEA) in partnership with the Limpopo Department of Economic Development, Environment and Tourism (LEDET), and the Waterberg District Municipality (WDM). The EMF will support decision-making in the Waterberg District Municipality area in order to facilitate appropriate and sustainable development. The EMF integrates policies and frameworks and aligns government mandates to streamline decision-making and to improve cooperative governance. The EMF has a number of specific objectives, which include identifying the status quo, development pressures and trends in the area and the development of a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.

### Geology, Landscape and Soils

The simplified geology of the Waterberg District can be classified into five distinct geology types, namely the Transvaal Super Group, Karoo Super Group, Waterberg Group, Bushveld Igneous Complex, and the Archaean Granite/Gneiss and Swazian Complex. The Karoo Super Group contains coal deposits while Bushveld Igneous Complex harbours important sources of platinum and chromium. The Waterberg Group contains no minerals of economic value. The Transvaal Super Group has iron ore deposits. The lithology of the area shows that there are 26 dominant rock types occurring in the Waterberg District. All of which are described.

The landscape of the Waterberg District is a unique feature that distinguishes it from any other place in South Africa. There are four main landscape features in the Waterberg District, namely the Waterberg Plateau, the Transvaal Plateau Basin, the Pietersburg Plain and the Limpopo Depression.

The character of the Waterberg Escarpment is an important feature of the area. It is an asset that should be protected. Similarly the wide open bushveld plains of the Limpopo Penneplain represent a special South African bushveld character. This character is one of the key selling points that the tourism sector employs in their marketing strategy.

Steep slopes have been identified in the EMF as they are inherently sensitive to change. The soil of the area is diverse. Major soil associations have been identified. These include weakly developed soils on mountainous catchments, uplands and rocky areas, dystrophic, red and yellow, freely draining sandy soils, and plinthic upland duplex and paraduplex soils on undulating middleveld, rugged terrain.

The agricultural potential of the area is intimately associated with topographical, pedological (soil) and climate determinants. Rainfall distribution is also an important factor in determining the agricultural potential.

### Climate

The northern and western regions of the area experience a hot and semi-arid climate. The southern and eastern regions are more humid and slightly cooler. The mean circulation of the atmosphere over southern Africa is anticyclonic throughout the year. Air circulations have implications for the dispersion of air pollution, and are influenced by a variety of factors. The main source of information for the atmospheric conditions and wind was taken from the Waterberg District Municipality's Air Quality Management Plan. No measurable evidence of global warming or climate change can be deduced from the information, due to significant natural fluctuations.

### Hydrology

The Waterberg District is covered by the Limpopo Water Management Area as well as the Crocodile (West) and Marico Water Management Area. The Waterberg District has five catchments that fall within its boundaries namely

- Lower Crocodile River Sub-catchment;
- Mokolo (or Mogol) River Catchment;
- Lephalala River Catchment;
- Mogalakwena River Catchment; and
- A small portion of the Olifants River Catchment.

Most of the rivers drain in a north-westerly direction to the Limpopo River.

Major dams in the Waterberg District Municipality area include the Mokolo Dam, the Doorndraai Dam, and the Glen Alpine Dam. Information regarding the health was obtained from the River Health Programme documents. Not all the catchments in the area have had studies completed. Most of the rivers appear to be in a fair condition. Groundwater is a limited but important resource in the area.

### Biology

Most of the study area falls within the Central Bushveld Bioregion, which falls within the Savanna Biome. There are also small patches of vegetation that fall within the Mesic Highveld Grassland Bioregion, which falls within the Grassland Biome. Patches of Azonal vegetation is also found within the area. Lowveld Riverine Forest, Springbokvlakte Thornveld, Central Sandy Bushveld, Makhado Sweet Bushveld and Subtropical Salt Pans are the vegetation types of most concern for conservation. There are 43 mammal species of conservation concern that occur in the study area. Thirteen of these species are threatened with extinction and are on the Red List.

Three centres of endemism occur near the eastern boundary of the Waterberg District. A small part of the Wolkberg Centre of Endemism occurs within the EMF study area. Conservation of this unique vegetation is important.

There are a number of protected areas within the Waterberg District, including Marakele National Park, Entabeni Nature Reserve, D'nyala Nature Reserve and Doorndraai Dam Nature

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Reserve to name a few. Some of these reserves have been incorporated into the Waterberg Biosphere Reserve. The Waterberg Biosphere Reserve is recognised by UNESCO. The presence of the Biosphere Reserve in the study area provides an opportunity to promote biodiversity conservation at the same time as advancing eco-tourism in the study area.

The Waterberg District's natural vegetation has experienced degradation in some areas. This includes urbanisation cultivation or mining. Severe over-grazing is problematic. Biodiversity hotspots and conservation priorities in the study area should be preserved before transformation leads to the loss of the entire area.

The ecological sensitivity of the area was determined using a number of factors, including vegetation types, the presence of rivers, streams, drainage lines and wetlands, presence of steep slopes or mountains and the potential presence of various plant and animal species of conservation concern.

## Cultural and Historical Features

This history of the Waterberg District extends as far back as the Stone Age and is diverse. The history was greatly influenced by natural phenomena and features of the area. Some important cultural and historical features of the area include rock paintings and stone tools of San hunters and Khoe Khoe herders, Bambata clay pottery, and also ruins of Langa Ndebele settlements. The Waterberg District has a rich cultural history also, with various tribes that inhabited the area, as well as the colonial settlements. The interaction between the colonial Voortrekkers and local tribes in the area are of importance especially at sites such as the Makapan's Caves.

## Air Pollution Potential

The Waterberg District Municipality Air Quality Management Plan, completed in June 2009 was used as the main source of information. The Air Quality Management Plan compiled an emissions inventory for the Waterberg District. This was compiled for air pollution sources where information was available or where

emission factors could be applied to quantify emissions. Pollution sources include power generation, mining, industrial emissions, domestic fuel burning, vehicle emissions, agricultural activities, biomass burning, waste treatment & disposal, and dust from various sources.

Currently, the air quality of the Waterberg District is fair, but with future development set to happen in the area, it is expected that air pollution will increase.

## Economic Characteristics and Drivers

The sector that contributes most to the GDP of the Waterberg District is mining. However, the sector that employs the largest number of people is agriculture. With future developments set to take place in the Waterberg District, it is likely that current GDP and employment trends will change. In terms of the population, three local municipalities registered positive growth with Modimolle registering the biggest growth followed by Mogalakwena. Changes of municipal demarcations may have impacted on the growth trends observed.

## Population Characteristics

The Waterberg District Municipality area has an estimated total population of 572 625. Most of the people in the District are distributed around Mogalakwena, Lephalale, as well as the Thabazimbi local municipality areas respectively. The education levels are relatively low within the Waterberg District. The working population tend to fall into two main brackets that earn between R1 to R400 and R6401 to R12 800 per month.

## Development Pattern

The primary activities of the Waterberg District include mining. The mining of minerals such as iron, platinum and coal has led to the development of nodes which have grown into the largest of the towns in the district. Lephalale is one of the areas with significant mining potential. Plans to expand mining in this area are already underway.

Agriculture is another primary activity. Commercial farming mainly occurs on the "Springbok flats" in the south-east of the district. Irrigated agriculture occurs along several of the rivers, most notably the Crocodile River. The Modimolle Local Municipality area and the Mookgophong Local Municipality area have strong agriculture sectors. Game and cattle farming also form an important component of the Waterberg District.

Secondary activity is mainly industrial development, especially around the Lephalale area. Small scale manufacturing and service industries are located in Bela-Bela, Thabazimbi and Mokopane.

The settlement pattern in the district is fairly dispersed, with a high concentration of towns and villages in the east and the south. Mining, topographical features, tribal land and major transport corridors contribute to the settlement pattern. Densification is taking place in some centres, including Lephalale, Mokopane, Thabazimbi and Bela-Bela.

Road links are fairly well established in the Waterberg District, these links include the N1, N1 – R33, R510, and R516. With the exception of the N1, which is a toll road, the R-routes are not well-maintained. Many of the roads have deteriorated, to the point of being a danger to travel on.

Although a rail link does exist between Lephalale and Thabazimbi, it will need to be upgraded to increase its capacity. This will allow coal to be transported by rail instead of by road as is currently the case.

Major towns such as Thabazimbi, Lephalale, Bela-Bela, Modimolle and Mokopane have airfields which accommodate light aircraft. At present no commercial flights exist.

The development in Lephalale will place a higher demand on the water resources of the area. The Mokolo and lower Crocodile Water Augmentation Project were commissioned to help combat the lack of water. The project will be implemented in three phases. The first phase involves the construction of pipelines that will run parallel to an existing pipeline. The second phase will involve the transfer scheme from the Crocodile River at Vlieeport near

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Thabazimbi to the Lephalale area. The last phase will involve De-bottlenecking. This entails the construction of the first 9 km of the proposed gravity pipeline (for Phase 1) with interconnections to the existing pipeline (Exxaro pipeline).

There are several challenges involved in the waste management in the Waterberg District. There are also several problems and challenges surrounding service delivery. Sanitation and sewage treatment are of particular concern. The Green Drop Report highlights the poor state of wastewater treatment plants in the Waterberg.

The Waterberg's Spatial Development Framework proposals for development are around existing structure. The Framework also recognises the importance of external linkages especially in terms of agriculture and conservation.

## PART B: STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN

### Key Issues

The key issues for this project were identified in three stages. In the first stage, key issues were identified by the project team, before the public participation process began. In the second stage, issues that arose during the first round of the public participation process were identified. During the third stage, additional and persistent issues that arose during the second round of the public participation process were identified.

Issues were categorised under the following headings:

- Water availability and utilisation
- Water quality and pollution
- Air Quality
- Noise
- Character of the Waterberg District
- Waterberg Biosphere Reserve

- Firewood
- Change to the population structure and socio-economic conditions
- Service Infrastructure Needs
  - Roads
  - Telecommunications
  - Electricity
  - Water and Sewage
  - Education and Skills Training
  - Waste Disposal
- Government
- Planning and Development

### Desired State

This section illustrates what is important to the different sectors as conveyed by participants in the stakeholder and the public participation process.

All the sectors expressed a need for improvement in service infrastructure. It is also generally expected that these improvements should be government's contribution to the economic development of the area over the short term.

The game framing community is being represented by various sub-groups whose activities are dictated by the specific "markets" they operate in, each with its own needs.

Due to the strict regulations that are applied many (not all) game farmers are of the opinion that they are unfairly discriminated on by government, which makes their industry unnecessarily difficult and expensive to the extent where it is becoming difficult to operate.

The tourism industry in the Waterberg District has a rich offering of landscape, biological and cultural features with a potential to develop a high quality tourism product for a variety of markets. It is

also very favourably located in relation to Gauteng which makes it an ideal area for weekend and short holiday breakaways.

There is a need for a strong "Waterberg brand", supported by government that promotes the area as a whole, as a destination.

Conservation expansion is focussed on the Waterberg Biosphere Reserve and the expansion thereof onto private property. There is very little public investment into the expansion of conservation areas, and the focus of the conservation authorities is therefore on the strict management of development and change on private land which could impact negatively on the natural environment.

Agriculture in the area is important for the production of food for the expanding markets in parts of the district and also for markets in nearby Gauteng. In addition, agriculture remains the most important employment sector in the district and as such has an important function in the stability of the social structure of the area. For these reasons it is important that current agricultural practices, especially intensive agriculture be maintained and be expanded onto additional high potential agricultural land in future.

Mining is the cornerstone of the economy of the district and currently accounts for more than 50% of the GDP of the area. It is highly unlikely that this contribution will decrease over the next 60 to 100 years. The mining industry is therefore important for the development of the district over the medium to long term.

There is a desperate need for clarity on what government's long term plans are in respect to the further development of the Waterberg Coal Field, especially in relation to electricity generation and potential liquid from coal processes. Commitments from government to supply adequate water, transport infrastructure and other necessary infrastructure is also required to reduce the risks of private enterprise and to make proper planning possible.

### Sensitivity Analysis

The sensitivity analysis together with the structural spatial elements (towns, villages, mineral resources, economic activities, etc.) identified in the status quo stages and the desired state

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provides the basis for the development of Environmental Management Zones (next section).

Based on the findings contained in the draft Desired State Report it was decided to do further analysis on the following aspects in order to refine a spatial base that would be relevant and accurate for the identification of Environmental Management Zones:

- General environmental sensitivity (ecological and landscape);
- Conservation planning (current protected areas and potential expansion areas);
- Water production priority areas; and
- Agricultural intensity (footprint).

## Environmental Management Zones

Initially the Environmental Management Zones (EMZ) for the Waterberg District EMF were determined through the careful evaluation of the status quo inputs and especially the environmental sensitivity and other priority needs in the area as described in the previous section of the report.

These Environmental Management Zones for the Waterberg have been revised and refined based on the following:

- Feedback from stakeholders and interested and affected parties on the Draft Desired State Report;
- feedback and input received during a workshop with municipal authorities;
- feedback and input received during a workshop with national and provincial authorities;
- feedback and input received from stakeholders and interested and affected parties on the draft Environmental Management Zones); and
- an in depth assessment of the wider regional context, including likely activities within Botswana.

The section provides a short description of each EMZ, a description of the desired state of each EMZ as well as an indication of activities that are preferred, compatible and undesirable in each EMZ. The following Environmental Management Zones have been identified:

- Zone 1: Protection of natural vegetation, scenic landscape and rock painting areas, with limited appropriate tourism;
- Zone 2: Nature and cultural tourism focus areas within a high quality natural setting;
- Zone 3: Game and cattle farming (including hunting) areas with commercial focus;
- Zone 4: Mining focus areas;
- Zone 5: Potential large industrial and related activities focus area;
- Zone 6: Restricted mining focus areas in aesthetic and/or ecological resource areas;
- Zone 7: Urbanisation focus areas and nodes;
- Zone 8: Rural settlement areas;
- Zone 9: Agriculture focus areas with a tourism component;
- Zone 10: Agriculture areas with commercial focus; and
- Zone 11: Major infrastructure corridors.

The application of the National Environmental Management Act and the Environmental Impact Assessment Regulations is in respect to the sensitive Zones 1 and 2 is also set out.

## Environmental Management Guidelines

In order to give guidance on certain important environmental issues, guidelines on the following issues have been included:

- Solid waste management and recycling;
- Sewage disposal;

- Transformation of land;
- Duty of care and remediation of environmental damage;
- Compensative investment; and
- Stream flow management.

## KAKARETŠO YA PHETIŠI

### MATSENO

Tlhako ya Bolaodi bja Tikologo (EMF) ke tšhišinyo ya Kgoro ya bosetšhaba ya Ditaba tša Tikologo (DEA) ka tšhomišanommogo le Kgoro ya Tlhabollo ya Ekonomi ya Limpopo, Tikologo le tša Boeti (LDEDET), le Mmasepala ya Selete sa Waterberg (WDM). EMF e tla thekga go tšea diphetho mo go lefelo la Mmasepala wa Selete sa Waterberg gore e kgone go nolofatša tlhabollo ya maleba le go swarelelago. EMF ikopantšha dipholisile ditlhako gomme ya tsepanya maatla a mmušo go kgetholla diphetho go kaonafatša mmušo wa tšhomišanommogo. EMF e na le palo ya dinepo tše di rilego, tšeo di akaretšago maemo a sa fetogago, dikgatelelo tša ditlhabollo le mekgwa ya mo lefelong le tlhabollo ya thekgo ya tshepetšo ya diphetho go tlhabollo ya lefelo go kgonthišiša gore mekgwa ya tilokogo, mathata le ditlapele di a šetšwa.

### THUTAFIKA

Thutafika ye e nolofaditšwego ya Selete sa Waterberg e ka arolwa go mehuta ye mehloano ye e ikgethago, e lego Transvaal Super Group, Karoo Super Group, Waterberg Group, Bushveld Igneous Complex, le Archaean Granite/Gneiss le Swazian Complex. Karoo Super Group e na le mafelo a malahla mola Bushveld Igneous Complex e ruile methopo ye bohlokwa ya platinamo le khroniamo. Waterberg Group e se na le diminerale tša boleng bja ekonomi. Thuto ya saense ya tlhago le popego ya maswika ya lefelo e laetša gore go na le mehuta ya maswika ye 26 yeo e renago yeo e diregago mo Seleteng sa Waterberg. Yeo ka moka e hlalošwago.

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Ponagalo ya naga ya Selete sa Waterberg e na le sebopego sa moswananoši yeo e e hlaolago go mafelo a mangwe afe goba afe a Afrika Borwa. Go na le dibopego tše kgolo tše nne mo go Selete sa Waterberg, e lego Polatou ya Waterberg, Molapo wa Polatou wa Transvaal, Molala wa Pietersburg le Sekoti sa Limpopo.

Semelo sa Mothepologa wa Waterberg ke sebopego se bohlokwa sa lefelo. Ke bohwa bjoo bo swanetšwego go šireletšwa. Go swana le melala ye bulegilego ya bophara ya dikgwa tša molala wa Pene wa Limpopo o emela semelo se kgethegilego sa dikgwa tša Afrika Borwa. Semelo se ke dintlha tša thekišo seo se dirago gore lefapha la boeti le se šomiše mo go togamaano ya bona ya papatšo.

Go direga ga monamelelo wa ditshekamo o hweditšwe mo go EMF ka ge di tlwaetše go šišimoga go phetogo. Mabu a lefelo a fapafapane. Ditswalano tše kgolo tša mabu di hweditšwe go ya ka ponagalo ya naga yeo e šetšego e bonwe mo go lefelo la Selete sa Mmasepala wa Waterberg. Se se akaretša mabu ao a hlabolotšwego ka bofokodi mo go dikageletšo tša dithabeng, mafelong a godimo le ao a nago le maswika, meetse ao a nago le esiti a maphefadi ao a se nago oksitšene, bohudedi le serolwana, mabu a santa ao a gamollago ka tokologo, le setena sa seloko se se hubedu se se lego gabedi sa lefelong la godimo le mabu a sa tlwaelegago a a lego gabedi mo go lefelo la nagagare bjo bo laetšago maphoto a makgawekgawe.

Kgonagalo ya temo ya lefelo e tswalane le tlhalošo ka botlalo, saense ya mabu (mobu) le ditšhupetši tša klaemete. Kabo ya pula le yona ke ntlha ye bohlokwa mo go šupetšeng kgonagalo ya temo.

## **KLAEMETE**

Dilete tša leboa le tša bodikela tša lefelo di itemogela klaemete ya go fiša le go hwetša pula ye nnyane ya ngwaga. Dilete tša borwa le Bohlabela di na le monola le go fola gannyane. Kelo ya tikološo ya lefaufau mo borwa bja Afrika e kgahlanong le ledimo ngwaga ka moka. Tikološo ya moya e na le ditlamorago tša phatlalatšo ya tšhilafatšo ya moya, gomme di hlohleletšwa ke dintlha tše di

fapafapanego. Mothopo wo mogolo wa tshedimošo mo go maemo a lefaufau le phefo a tšerwe go tšwa go Leano la Bolaodi bja Boleng bja Moya la Selete sa Mmasepala wa Waterberg. Ga go bohlatse bjoo bo ka elwago bja go ruthala goba go fetoga ga klaemete bjoo bo ka ntšhwago go tšwa go tshedimošo, ka lebaka la go fetogafetoga ga tlhago.

## **HAEDROLOTŠI**

Selete sa Waterberg se khupeditšwe ke Lefelo la Bolaodi bja Meetse la Limpopo ga mmogo le Lefelo la Bolaodi bja Meetse la Kwena (Bodikela) le Mariko. Selete sa Waterberg se na le mafelo a mahlano a kageletšo ya meetse ao a welago gona mo go mellwane ya gona e lego:

- Seka-kageletšo sa Noka ya ka Fase ya Kwena;
- Kageletšo ya Noka ya Mokolo (goba Mogol);
- Kageletšo ya Noka ya Lephalala River;
- Kageletšo ya Noka ya Mogalakwena; le
- Karolwana ye nnyane ya Kageletšo ya Noka ya Lepelle

Bontši bja dinoka di elela ka tsela ya leboa-bodikela go Noka ya Limpopo.

Matamo a magolo mo go lefelo la Selete sa Mmasepala wa Waterberg a akaretša Letamo la Mokolo, Letamo la Doorngraai, le Letamo la Glen Alpine. Tshedimošo mabapi le tša pholo tša dinoka tše di hwetšwego go na le lefelong di hweditšwe go tšwa go ditokomane tša Porograma ya Kalafo ya Noka. Ga se dikageletši ka moka mo lifelong le tše di thuto tša gona di phethilwego. Bontši bja dinoka bo bonala go ba le maemo a a kaone. Meetse a ka fase ga mobu ke mothopo wo o lekanego mo lefelong le

## **THUTAPHEDI**

Bontši bja lefelo la thuto bo mo go Central Bushveld Bioregion, seo se welago ka fase ga Savanna Biome. Go na le gape dipatso tše nnyane tša dimela tše di welago ka fase ga Mesic Highveld Grassland Bioregion, tše di welago ka fase ga Grassland Biome.

Dipatso tša dimela tša Azonal di hwetša mo go lefelo. Dithokgwa tša Lowveld Riverine, Springbokvlakte Thornveld, Central Sandy Bushveld, Makhado Sweet Bushveld le Subtropical Salt Pans ke mehuta ya dimela tše di swanetšwego go bolokwa. Go na le mehuta ye 43 ya diamuši tše di swanetšwego go bolokwa tše di diregago mo go thuto ya lefelo. Mehuta ye lesometharo ya tše e tšhošetšwa go ka phedišo gomme di mo go Lenaneo le le Hubedu.

Disenthara tše tharo tša lefelo leo la moswananoši e direga kgauswi le mollwane wa ka bohlabela bja Selete sa Waterberg. Karolwana ye nnyane ya Senthara ya Wolkberg ya Lefelo la Moswananoši e direga gona mo go thuto ya lefelo la EMF. Poloko ya mohuta wa moswana noši ya dimela tše e bohlokwa.

Go na le palo ya mafelo ao a šireletšwego mo go Selete sa Waterberg, go akaretša Marakele National Park, Entabeni Nature Reserve, D’Nylala Nature Reserve le Doorndraai Dam Nature Reserve go bala tše mmalwa. Tše dingwe tša dibolokwa di tsentšwe ka go Waterberg Biosphere Reserve. The Waterberg Biosphere Reserve e lemogwa ke UNESCO. Go ba gona ga Biosphere Reserve mo go lefelo la thuto go fana ka monyetla wa go godiša poloko ya go fapafapana ga diphedi ka nako e tee go tšwetša pele ekonomi ya boeti mo go lefelo la thuto.

Dimela tša tlhago tša Selete sa Waterberg di itemogetše go kokobala mo mafelong a mangwe. Se se akaretša temo ya metsetoropo goba go rafa. Go fudiša go feta tekano ke bothata. Mafelo a go fapafapana a diphedi ao a fišago kudu le go omelela le ditlapele tša poloko mo go lefelo la thuto di swanetšwe go lotwa pele dipheto go di iša go tahlegelo ya lefelo ka moka.

Go ba le go kwala ga diphedi tša lefelo di laeditšwe ka go šomiša palo ya mabaka, go akaretšwa mehuta ya dimela, go ba gona ga dinoka, megola, methalo ya kgamollo le lefelo la diphedi tša mehutahuta, go ba gona ga mesekamo ye e rotogago goba dithaba le kgonagalo ya go ba gona ga dibjalo tša mehutahuta le mehuta ya diphoofolo di swanetšwe go bolokwa.

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## DIPONAGALO TŠA SETŠO LE HISTORI

Histori ya Selete sa Waterberg e thoma kgalekgale ka nako ya lo Stone Age gomme e fapane. Histori e hueditšwe kudu ke ponagalo ya tlhago le diponagalo tša lefelo. Diponagalo tše dingwe tše bohlokwa tša setšo le histori tša lefelo di akaretša diswantšho tša maswika a go pentiwa le didirišwa tša maswika tša batsomi ba MaSan le badiši ba MaKhoekhoe, dipitša tša go bopša ka letsopa tša Bambata, le marope a madulo a Langa Ndebele. Selete sa Waterberg se humile gape ka histori ya setšo, ka mehlobohlobo ya merafe yeo e dulago mo lefelong, ga mmogo le badudi ba makoloni. Tswalano magareng ga MaVoortrekker a makoloni le merafe ya selegae mo lefelong ke ye bohlokwa kudukudu mo ditsheng tša Magaga a Makapan (Makapan's Caves).

## KGONAGALO YA TŠHILAFALO YA MOYA

Leano la Bolaodi bja Boleng bja Moya la Selet sa Mmasepala wa Waterberg, leo le feditšwe ka Juni 2009 le šomišitšwe bjalo ka mothopo wo mogolo wa tshedimošo. Leano la Bolaodi bja Boleng bja Moya bo kgobokeditše lenaneo la phatlalatšo la Selete sa Waterberg. E kgobokeletšwe go ba methopo ya tšhilafatšo ya moya moo tshedimošo e bego e le gona gona mabaka a phatlalatšo a ka dirišwago go ela phatlalatšo. Methopo ya tšhilafatšo e akaretša phehlo ya maatla a mohlakase, go rafa (mmaena), diphatlatšo tša diintaseteri, go tuka ga dibešwa tša ka gae, phatlalatšo ya dinamelwa, ditiro tša temo, go tuka ga biomass, tlhwekišo ya meetse & tahlo, le lerole go tšwa go methopo ye e fapanego.

Ga bjale, boleng bja moya bja Selete sa Waterberg bo magareng, eupša ka ge go na le ditlhabollo tša ka moso tšeo di šetšego di beakantšwe go ka direga mo lefelong, go letetšwe gore tšhilafalo ya moya e tla oketšega.

## MEKGWA YA EKONOMI LE TŠEO DI E SEPEDIŠAGO

Lefapha leo le abago kudu go GDP ya Selete sa Waterberg ke mmaene. Le ge go le bjalo, lefapha leo le thwalago palo ye ntši ya batho ke temo. Ka ditlhabollo tša išago tšeo di tlilego go direga mo go Selete sa Waterberg, go na le kgonagalo ya gore GDP ya ga

bjale le mekgwa ya thwalo e tla fetoga. Go ya ka baagi, memmasepala ya selegae e meraro e ngwadišitše kgolo gomme Modimolle e ngwadišitše kgolo ya godimodimo ka 70% e latelwa ke Mogalakwena ka 27%. Phetošo ya mellwane ya mmasepala e ka ba e na le kamego mo go mekgwa ye e bonwego ya kgolo.

## MEKGWA YA BAAGI

Lefelo la Selete sa Mmasepala wa Waterberg se na le palomoka ya baagi ba ka bago 572 625 go ya ka difiwa (data) tša baagi tša 2007. Batho ka bontši mo go Selete ba phatlaladitšwe mo mafelong a memmasepala ya selegae ya Mogalakwena, Lephallale, ga mmogo le Thabazimbi ka tatelano. Maemo a thuto ka tlwaelo a fase mo go Selete sa Waterberg. Baagi bao ba šomago ba gola magareng ga R1 go ya go R400 le R6401 go ya go R12 800 ka kgwedi.

## PATRONE YA TLHABOLLO

### Patrone ya tlhabollo ya ekonomi

Ditiro tša motheo tša Selete sa Waterberg di akaretša mmaene. Go rafša ga diminerale tša go swana le ayone, platinamo le malahla di dirile gore go be le tšwetšopele ya go kopanya yeo e gotšego go ba ditrope tše kgolokgolo mo seleteng. Lephallale ke ye nngwe ya mafelo ao go renago kgonego ya go fara (mmaena). Mananeo a go katološa go rafa (mmaena) mo lefelong le a šetše a le tseleng.

Temo e bopa karolo ye nngwe ya tiro ya motheo. Kgwebo ya thuo e direga kudu mo go "Springbok flats" borwa-bohlabela bja selete. Temo ya mašemo e direga kgauswi le dinoka tše mmalwa. Lefelo la Mmasepala wa Selegae wa Modimolle le lefelo la Mmasepala wa Selegae wa Mookgophong e na le mafapha a temo a a tiilego. Borui bja diphoofolo tša naga le dikgomo le tšona di bopa karolo ye bohlokwa ya Selete sa Waterberg.

Tiro ya bobedi e theilwe kudukudu mo go tswetšopele ya intaseteri, kudukudu mo lefelong leo le lego mo go Lephallale. Ditšweletšwa tša kelo ye nnyane le ditirelo tša intaseteri di hwetšwa Bela-Bela, Thabazimbi le Mokopane.

## Patrone ya go boikagelo

Patrone ya boikagelo mo go selete se e phatlaladitšwe ka lekana, ka tlhokomelo e kgolo ya ditrope le metsana ka Bohlabela le leboa. Mmaene, diponagalo tša sebopego, naga tša setšhaba le mekgoro ye megolo ya dinamelwa e abela patrone ye ya boikagelo. Pitlagano e a direga mo go disenthara tše dingwe, go akaretša Lephallale, Mokopane, Thabazimbi le Bela-Bela.

Dikgokaganyo tša ditsela di hlomilwe gabotse mo go Selete sa Waterberg, dikopanyo tše di akaretša N1, N1 – R33, R510, le R516. Ka ntle ga N1, yeo e lego tsela ya go patelwa (toll road), Ditsela ga di hlokomelwe gabotse. Bontši bja tšona maemo a gona a wetše fase, mo elego gore dikotsi go ka di šomiša.

Le ge go na le kopanyo ya seporo magareng ga Lephallale le Thabazimbi, e nyaka go kaonafatšwa go oketša mothamo. Se se tla dumelela go rwalwa ga malahla ka setimela lebakeng la go šomiša tsela go swana le le bakeng la ga bjale.

Ditrope tše kgolo tša go swana le Thabazimbi, Lephallale, Bela-Bela, Modimolle le Mokopane di na le maemafofanenyana ao a šomišetšwago difofane tše nnyane. Ga bjale ga go na diphofo tša kgwebo.

Tlhabollo ya Lephallale e tla bea godimo nyakego ya methopo ya meetse mo lefelong. Protšeke ya Mokolo le Katološo ya Meetse ya Mogalakwena ya ka fase e laetšwe go thuša go thibela tlhokego ya meetse. Protšeke e tla tsenywatirišong go ya ka dikgato tše tharo. Kgato ya mathomo e ama kago ya dphaepe tšeo di tlogo go sepela kgauswi le diphaepe tšeo di lego gona. Kgato ya bobedi e tla ama sekema sa phetišetšo go tšwa go Noka ya Mogalakwena (Crocodile River) ko Vlieeport kgauswi Thabazimbi go lefelo la Lephallale. Kgato ya mafelelo e tla ama go šomana le pitlagano goba go pitlaganolla. Se se bolela ka kago ya 9 km tša mathomo tša boima bja phaephe (ya Kgato ya 1) le dikgomaganyo go phaephe yeo e lego gona (phaephe ya Exxaro).

Go na le ditlhohlo tše mmalwa tšeo di amago bolaodi bja ditlakala mo go Selete sa Waterberg. Go na le gape mathata a mmalwa le

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ditlhohlo tšeo di amago kabo ya ditirelo. Tlhwekišo le kalafi ya keeletšhila ke tšona tšeo di nyakago tlhokomelo ye e rilego. Pego ya Green Drop e tšweletša maemo a mabe a dipolanta tša kalafi ya meetse ao a šomišitšwego mo Waterberg.

Ditšhišinyo tša Tlhako ya Tlhabollo ya Sekgoba ya Waterberg tša go hlabbolla dikago tšeo di lego gona. Tlhako e lemoga gape bohlokwa bja dikopanyo tša ka ntle kudukudu go ya ka mabaka a temo le poloko.

## **KAROLO YA B: LEANO LA BOLAODI BJA TOGAMAANO LA TIKOLOGO**

### **Ditabkgolo**

Ditabkgolo tša protšeke ye di kgethilwe ka dikgato tše tharo. Mo go kgato ya mathomo, ditabkgolo di ile tša lemogwa ke sehlopha sa protšeke, pele tshepetšo ya bokgathatema ga setšhaba go thoma. Mo go kgato ya bobedi, ditaba tšeo di tšweletšego mo go kgatheng tema ga setšhaba ga mathomodi ile tša kgethwa. Ka nako ya kgato ya boraro, ditaba tše di okeditšwego le tšeo di tšwelelago kgafetšakgafetša tšeo di tšweletšego ka nako ya bobedi ya go kgathatema ga setšhaba go ile gwa lemogwa.

Ditaba di be di arotšwe go ya ka dihlogo tše di latelago:

- Go ba gona ga meetse le tšhomišo ya ona
- Boleng bja meetse le tšhilafalo
- Boleng bja moya
- Lešata
- Mokgwa wa Selete sa Waterberg
- Waterberg Biosphere Reserve
- Magong a mollo
- Phetošo go sebopego sa baagi le maemo a selegae a ekonomi
- Dinyakwa tša lenaneokgoparara la ditirelo

- Ditsela
- Megala ya Dikgokagano
- Mohlakase
- Meetse le Keleetšhila
- Thuto le Tlhahlo ya Mabokgoni
- Tahlo ya Ditšhila

- Mmušo
- Peakanyo le Tlhabollo

### **Ditakatso tša mmušo**

Karolo ye e laetša seo se lego bohlokwa go mafapha a a fapanego bjalo ka ge a boletšwe ke bakgathatema mo go tshepetšo ya moamegi le bokgathatema bja setšhaba.

Mafapha ka moka a tšweleditše senyakwa sa go kaonafatša mo go lenaneokgoparara la ditirelo. Go letetšwe gape ka kakaretšo gore dikaonafatšo tše e swanetše go ba kabelo ya mmušo go tlhabollo ya ekonomi ya lefelo mo nakong ye kopana.

Setšhaba sa balemirui ba diphoofolo tša naga se emetšwe ke dihlophana tše nnyane tšeo ditiro tša tšona di laolwago ke 'mebaraka' ye e rilego moo di šomago mo go ye nngwe le ye nngwe go ya ka dinyakwa tša tšona.

Ka lebaka la melawana ye laolago ka bogale yeo e šomišwago bontši bja (e sego ka moka) balemirui ba diphoofolo tša naga ban a le kgopolo ya gore ba kgethollwa ke mmušo, gomme se se dira gore intaseteri ya bona e be ye thata le go tura kudu moo ba hwetšago go le boima go e sepetša.

Intaseteri ya tša boeti mo go Selete sa Waterberg se humile ka kabo ya ponagalo ya naga, dibopego tša diphedi le setšo le kgonagalo ya go tšwetšapele boleng bja godimo bja ditšweletšwa tša boeti go mebaraka ye e fapafapanego. Ke lefelo gape leo le beilwego gabotse mo go tswalano le Gauteng yeo e dirago gore e

be lefelo la makgonthe la boeti ka nako ya mafelelo a beke le ka maikhutšo a makopana.

Go na le nyakego ye kgolo ya "Waterberg brand", ye e thekgwago ke mmušo yeo e tla godišago lefelo ka bophara, bjalo ka lefelo la ketelo.

Katološo tša tšhireletšo e tsepeletšwe mo go Waterberg Biosphere Reserve gomme katološo yeo e mo go thoto ya poraefete. Go na le peeletšo ye nnyane ya setšhaba mo go katološo ya mafelo ao a šireletšwago, gomme tsepelelo ya balaodi ba tšhireletšo e mo go bolaodi bjo bo ngangilego bja tlhabollo le phetogo mo go naga ya poraefete yeo e ka bago le thulano ye mpe mo go tikologo ya tlhago.

Temo mo lefelong le e bohlokwa mo go ditšweletšo tša dijo go mebaka ye e golago mo go dikarolo tša selete le gape mo go mebaraka ya kgauswi ya Gauteng. Go oketša, temo e dula e le lefapha le bohlokwa la kabo ya mešomo mo seleteng se ka fao e na le mošomo wo bohlokwa mo go tiišeng kago ya selegae ya lefelo. Go ya ka mabaka a go bohlokwa gore ditiro tša ga bjale tša temo, kudukudu temo ye e tseneletšego e hlokomelwe le go godišwa go ya go kgonego ya godimo ye e okeditšwego ya naga ya temo mo išago.

Mmaene ke motheo wa ekonomi ya selete gomme ga bjale e swere go feta 50% ya GDP ya lefelo. Go na le kgonagalo ye nnyane ya gore kabo ye e ka fokotšega mo mengwageng ye 60 go ya go 100 ye e tlogo. Ka fao, intaseteri ya mmaene e bohlokwa mo go tlhabollo ya selete mo lebakeng la magareng go ya go lebaka le le telele.

Go na le nyakego ye e tiilego ya kwešišo ya gore maneo a mmušo a lebaka le le telele a mabapi le tšwetšopele ya tlhabollo ya Waterberg Coal Field, kudukudu ge e tswalana le phehlo ya mohlakase le kgonagalo ya diela go tšwa go ditšweletšwa tša malahla. Maitlamo go tgo mmušo ka go fana ka meetse a a lekanego, mananeokgoparara a dinamelwa le mananeokgoparara

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a mangwe ao a nyakegago go fokotša dikotsi tša dikgwebo tša poraefete le go dira peakanyo ye e lokilego ge go kgonega.

## Tshekatsheko ya tšhišimogelo

Tshekatsheko ya tšhišimogelo ga mmogo le dielemente tša sebopego sa sekgoba (ditoropo, metsana, methopo ya dinimerale, ditiro tša ekonomi, bjbj) tšeo di kgethilwego mo go dikgato tša maemo a a swanago le maemo ao a kganyogwago a fana ka motheo wa tlhabollo ya Dizounu tša Bolaodi bja Tikologo (karolo ye e latelago).

Go theilwe mo go dikhwetšo tšeo di lego ka go Pegokakanywa ya Maemo a Kganyogwago go ile gwa tšeiwa sephetho sa go dira ditshekatsheko tše dingwe gape mo go dintlha tše di latelago gore go hwetšwe motheo wa sekgoba woo o tla bago maleba le go nepagala mo go kgetho ya Dizounu tša Bolaodi bja Tikologo:

Tšhišimogelo ka kakaretšo ya tikologo (mokgwa wa diphedi le ponagalo ya naga);

- Peakanyo ya tšhireletšo (mafelo ao a širetšwago ga bjale le kgonagalo ya katološo ya mafelo);
- Mafelo a ditlapele a tšweletšo ya meetse; le
- Tiišetšo ya temo (mohlala).

## Dizounu yatša Bolaodi bja Tikologo

Mathomong Dizounu yatša Bolaodi bja Tikologo (EMZ) tša Selete sa Waterberg EMF di be di hlaolwa ka lekodiša gabotse maemo a go swana a ditsenywa le gona kudukudu go kwa ga tikologo le dinyakwa tše dingwe tša ditlapele mo lifelong bjalo ka ge le hlalošwa mo go karolo ye e fetilego ya pego.

Dizounu yatše tša Bolaodi bja Tikologo ya Waterberg di fetošitšwe le go hlwekišwa go theilwe go tše di latelago:

- Dikarabo go tšwa go baamegi le diphathi tšeo di nago le kgahlego le go amega mo go Pegokakanywa ya Dikganyogo ya Mmušo;

- Dikarabo le ditshwaelo tšeo di amogetšwego ka nako ya wekshopo le bolaodi bja mmasepala;
- Dikarabo le ditshwaelo tšeo di amogetšwego ka nako ya wekshopo ya bolaodi bja bosetšhaba le diprofense;
- Dikarabo le ditshwaelo tšeo di amogetšwego go tšwa go baamegi le diphathi tšeo di nago le kgahlego le go amega mo go Bolaodi bja Tikologo ya seakanywa Zon); le
- Tekolo ye e tseneletšego ya kamego ka bophara ya selete, go akaretšwa kgonagalo ya ditiro mo Botswana.

Karolo e fana ka tlhalošo ka boripana ya EMZ ye nngwe le ye nngwe, tlhalošo ya maemo a ratwago a EMZ ye nngwe le ye nngwe ga mmogo le taetšo ya ditiro tšeo di ratwago, go kwana le go se kwane mo go EMZ ye nngwe le ye nngwe. Dizounu yatše di latelago tša Bolaodi bja Tikologo di ile tša lemogwa:

- Zounu ya1: Tšhireletšo ya dimela tša tlhago, ponagalo ya naga ye e botse le mafelo ao a nago maswika ao a pentilwego, ao a nago baeti ba maleba bao ba kgaotšwago;
- Zounu ya2: Mafelo ao a tsepametšego go boeti bja tlhago le setšo gona mo go peakanyong ya boleng bja tlhago;
- Zounu ya 3: Mafelo a temo ka diphoofolo tša naga le dikgomo (go akaretšwa go tsoma) go tsepeletšwe go kgwebo;
- Zounu ya 4: Mafelo ao go tsepeletšwego go meepo (mmaena);
- Zounu ya 5: Lefelo leo le tsepeletšwego go kgonagalo ye kgolo ya ditiro tša intaseteri le tšeo di tswalanego le tšona;
- Zounu ya 6: Mafelo a tsepelelo a kgaoletšago meepo mo go methopo ya mafelo a temogišo ya bokgabo le/goba mekgwa ya diphedi;
- Zounu ya 7: Mafelo a tsepelelo a kago ya metsetoropo le makala a gona;

- Zounu ya 8: Mafelo a boikagelo bja dipolaseng;
- Zounu ya 9: Mafelo a tsepelelo ya temo ao a nago le karolo ya boeti;
- Zounu ya10: Mafelo a temo ka tsepelelo ya kgwebo; le
- Zounu ya11: Mekgoro ye megolo ya mananeokgoparara.

Go beiwa gape ga tirišo ya Molao wa Bosetšhaba wa Bolaodi bja Tikologo le Melawana ya Tekolo ya thulano ya Tikologo go ya ka go šišimogela ga Dizounu tša 1 le 2.

## Methalohlahli ya bolaodi bja Tikologo

Go re go tle go fiwe tlhahli ka ga bohlokwa bja ditaba tša tikologo, methalohlahli mo go ditaba tše di latelago e akareditšwe:

- Bolaodi bjo bo tiilego bja ditšhila le go mpshafatša gape;
- Tahlo ya kelelatšhila;
- Phetošo ya lefase;
- Mošomo wa go hlokomela le tokišo ya ditshenyego tša tikologo;
- Peeletšo ya putswetšo; le
- Tshepetšo ya kelelo ya bolaodi.

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## BEKNOPTE OORSIG

### INLEIDING

Die Omgewingbestuursraamwerk (OBR) is 'n inisiatief van die nasionale Departement van Omgewingsake (DOS) in vennootskap met die Departement van Ekonomiese Ontwikkeling, Omgewing en Toerisme van Limpopo (DEOOTL) en die Waterbergdistriksmunisipaliteit (WDM). Die OBR sal besluitneming in die gebied van die Waterbergdistriksmunisipaliteit steun ten einde gepaste en volhoubare ontwikkeling te fasiliteer. Die OBR integreer beleide en raamwerke en bring regeringsmandate in lyn ten einde besluitneming te stroomlyn om koöperatiewe regeringsbestuur te verbeter. Die OBR het 'n aantal spesifieke doelwitte, waaronder die identifisering van die status quo, ontwikkelingsdruk en tendense in die gebied en die ontwikkeling van 'n besluitsteunstelsel vir ontwikkeling in die gebied om te verseker dat omgewingskenmerke, -kwessies en -prioriteite in ag geneem word.

### Geologie, Landskap en Gronde

Die vereenvoudigde geologie van die Waterbergdistrik kan geklassifiseer word in vyf duidelike geologiese tipes, naamlik die Transvaalsupergroep, die Karoosupergroep, die Waterberggroep, die Bosveldstollingskompleks en die Argeïesegraniet/gneiss-en-Swazikompleks. Die Karoosupergroep bevat steenkoolneerslae terwyl die Bosveldstollingskompleks belangrike bronne van platinum en chroom bevat. Die Waterberggroep bevat geen minerale met 'n ekonomiese waarde nie. Die litologie van die gebied toon dat daar 26 dominante rotstipes in die Waterbergdistrik voorkom. Almal word beskryf.

Die landskap van die Waterbergdistrik is 'n unieke kenmerk wat dit van enige ander plek in Suid-Afrika onderskei. Daar is vier hooflandskapkenmerke in die Waterbergdistrik, te wete die Waterbergplato, die Transvaalplatokom, die Pietersburgvlakte en die Limpopodepressie.

Die aard van die Waterbergplatorand is 'n belangrike kenmerk van die gebied. Dit is 'n bate wat beskerm moet word. Net so verteenwoordig die wye, oop bosveldvlaktes van die Limpoposkiervlakte 'n spesiale Suid-Afrikaanse bosveldkarakter. Hierdie karakter is een van die sleutelverkoopspunte wat die toerismesektor in sy bemarkingstrategie gebruik.

Die voorkoms van steil hellings word in die OBR geïdentifiseer aangesien hulle inherent sensitief vir verandering is. Die grond in die gebied is divers. Belangrike grondassosiasies is geïdentifiseer in ooreenstemming met die bestaande landskapgrondrelasies wat reeds in die gebied van die Waterbergdistriksmunisipaliteit waargeneem is. Dit sluit in swak ontwikkelde grondsoorte in bergagtige opvanggebiede, hooglande en rotsagtige gebiede; distrofiese rooi en geel vry dreinerende sandgrondsoorte; en plintiese hoërliggende duplex- en paraduplexgrondsoorte in golwende middelveld en ongelyke terrein.

Die landboupotensiaal van die gebied het 'n nou verband met topografiese, pedologiese (grond-) en klimaatsdeterminante. Reënvalverspreiding is ook 'n belangrike faktor by die bepaling van landboupotensiaal.

### Klimaat

Die noordelike en westelike streke van die gebied het 'n warm en halfdor klimaat. Die suidelike en oostelike streke is meer vogtig en effens koeler. Die gemiddelde sirkulasie van die atmosfeer oor suidelike Afrika is antisiklonaal dwarsdeur die jaar. Lugsirkulasie het implikasies vir die verspreiding van lugbesoedeling en word deur 'n verskeidenheid faktore beïnvloed. Die hoofbron van inligting oor die atmosferiese toestande en wind is uit die Waterbergdistriksmunisipaliteit se Luggehaltebestuursplan geneem. As gevolg van natuurlike fluktuasies kan geen meetbare bewys van aardverwarming of klimaatsverandering uit die beskikbare inligting afgelei word nie.

Die Waterbergdistrik word gedek deur die Limpopowaterbestuursgebied en die Krokodil (Wes)- en die

Maricowaterbestuursgebied. Daar is vyf opvanggebiede binne die grense van die Waterbergdistrik, naamlik:

- Onder-Krokodilriviersubopvanggebied
- Mokolo- (of Mogol-) rivieropvanggebied
- Lephalarivieropvanggebied
- Mogalakwenarivieropvanggebied
- 'n Klein gedeelte van die Olifantsrivieropvanggebied

Die meeste van die riviere dreineer in 'n noordwestelike rigting na die Limpoporivier.

Die vernaamste damme in die gebied van die Waterbergdistriksmunisipaliteit sluit in die Mokolodam, die Doordraaidam en die Glen Alpine-dam. Inligting oor die gesondheid van die riviere wat binne die gebied verkry is, is uit die Riviergesondheidsprogram-dokumente verkry. Daar is nie voltooides studies vir al die opvanggebiede in die gebied nie. Die meeste van die riviere is oënskynlik in 'n goeie toestand. Grondwater is 'n beperkte hulpbron in die gebied.

### Biologie

Die grootste deel van die studiegebied lê binne die sentrale bosveldbiostreek, wat in die savannebloom val. Daar is ook klein kolletjies plantegroei wat in die mesiese hoëveldgrasveldbiostreek val, wat weer in die grasveldbloom val. Kolle asonale plantegroei kom ook in die gebied voor. Laeveldoewerbos, Springbokvlaktedoringveld, sentrale sanderige bosveld, Makhado soet bosveld en subtropiese soutpanne is die plantegroeitipes wat vir bewaring van belang is. Daar is 43 soogdierspesies van bewaringsbelang in die studiegebied. Dertien van hierdie spesies word deur uitwissing bedreig en is op die Rooi Lys.

Drie sentrums van inheemsheid kom naby die oostelike grens van die Waterbergdistrik voor. 'n Klein deeltjie van die Wolkberginheemsheidsentrum kom binne die OBR-studiegebied voor. Dit is belangrik om hierdie unieke plantegroei te bewaar.

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Daar is 'n aantal beskermdede gebiede in die Waterbergdistrik, waaronder die Marakele Nasionale Park, Entabeni-natuurreservaat, D'Nyalanatuurreservaat en die Doorndraaidamnatuurreservaat, om maar 'n paar te noem. Sommige van hierdie reservate is in die Waterbergbiosfeerreservaat geïnkorporeer. Die Waterbergbiosfeerreservaat word deur UNESCO erken. Die aanwesigheid van die biosfeerresevat in die studiegebied is 'n geleentheid om biodiversiteitbewaring saam met ekotoerisme in die studiegebied te bevorder.

Die natuurlike plantegroei van die Waterbergdistrik is in sommige gebiede gedegradeer. Dit sluit in verstedeliking, landbou of mynbou. Ernstige oorbeweiding is 'n probleem.

Biodiversiteitsgevaarlike en bewaringsprioriteite in die studiegebied moet bewaar word voordat transformasie tot die verlies van die hele gebied lei.

Die ekologiese sensitiviteit van die gebied is bepaal deur 'n aantal faktore in ag te neem, waaronder plantegroeitipes, die aanwesigheid van riviere, strome, dreineerlyne en vleilande, die aanwesigheid van steil hellings of berge en die potensiële aanwesigheid van verskeie plant- of dierspesies van bewaringsbelang.

## **Kulturele en Historiese Eienskappe**

Die geskiedenis van die Waterberg strek sover terug as die Steentydperk en is uiteenlopend. Die geskiedenis is sterk beïnvloed deur natuurverskynsels en die eienskappe van die gebied. Van die belangrike kulturele en historiese eienskappe van die gebied sluit in rotstekeninge en klipgereedskap van Sanjagters en Khoe-Khoe-veewagters, Bambata-erdewerk, sowel as ruïnes van Langa Ndebele-nedersettings. Die Waterbergdistrik het ook 'n ryk kultuurgeskiedenis, met verskeie stamme wat die gebied bewoon het sowel as die koloniale nedersettings. Die interaksie tussen die koloniale Voortrekkers en die plaaslike stamme in die gebied is van belang, veral by terreine soos die Makapansgrotte.

## **Lugbesoedelingspotensiaal**

Die Luggehaltebestuursplan van die Waterbergdistriksmunisipaliteit, wat in Junie 2009 voltooi is, is as die hoofbron van inligting gebruik. Die Luggehaltebestuursplan bevat 'n emissie-inventaris vir die Waterbergdistrik. Dit is opgestel vir bronne van besoedeling waar inligting beskikbaar was of waar emissiefaktore toegepas kon word om emissies te kwantifiseer. Bronne van besoedeling sluit in kragontwikkeling, mynbou, nywerheidsemissies, huishoudelike brandstofverbranding, voertuigemissies, landbouaktiwiteite, biomassaverbranding, afvalbehandeling en -verwerking, en stof afkomstig van verskillende bronne.

Die luggehalte in die Waterbergdistrik is tans redelik, maar met toekomstige ontwikkelings wat in die gebied gaan plaasvind, word daar verwag dat lugbesoedeling gaan toeneem.

## **Ekonomiese Eienskappe en Drywers**

Mynbou is die sektor wat die meeste tot die BBP van die Waterbergdistrik bydra. Landbou is egter die sektor wat die grootste aantal mense in diens het. Met toekomstige ontwikkeling wat in die Waterbergdistrik gaan plaasvind, sal die huidige BBP- en werkverskaffingstendense waarskynlik verander. Met betrekking tot die bevolking, het drie plaaslike munisipaliteite positiewe groei getoon, met Modimolle wat die grootste groei van 70% getoon het, gevolg deur Mogalakwena met 27%. Die verandering van munisipale grense kon dalk ook 'n groot invloed op die waargeneemde groeitendense gehad het.

## **Bevolkings Eienskappe**

Volgens die 2007-bevolkingsdata is daar in die Waterbergdistriksmunisipaliteit se gebied 'n geraamde totale bevolking van 572 625. Die meeste van die mense in die distrik is versprei in die gebiede van onderskeidelik die Mogalakwena, Lephalale en Thabazimbi Plaaslike Munisipaliteit. Die vlakke van onderwys in die Waterbergdistrik is betreklik laag. Die werkende bevolking verdien van R1 tot R400 en R6 401 tot R12 800 per maand.

## **Ontwikkelingspatroon**

### **Patroon van ekonomiese ontwikkeling**

Mynbou is een van die primêre aktiwiteite in die Waterbergdistrik. Die ontginning van minerale soos yster, platinum en steenkool het gelei tot die ontwikkeling van nodusse wat tot die grootste dorpe in die distrik gegroei het. Lephalale is een van die gebiede met dominante mynboupotensiaal. Planne om mynbou in die gebied uit te brei, word reeds beraam.

Landbou is 'n ander primêre aktiwiteit. Kommersiële boerdery vind hoofsaaklik op die Springbokvlakte in die suidooste van die distrik plaas. Besproeiingsboerdery vind langs verskeie van die riviere plaas. Daar is sterk landbousektore in die gebied van die Modimolle Plaaslike Munisipaliteit en Mookgophong Plaaslike Munisipaliteit. Wild- en beesboerdery is ook 'n belangrike komponent in die Waterbergdistrik.

Sekondêre aktiwiteite bestaan hoofsaaklik uit nywerheidsontwikkeling, veral in die Lephalalegebied. Daar is kleinskaalse vervaardigings- en diensnywerhede in Bela-Bela, Thabazimbi en Mokopane.

### **Nedersettingspatroon**

Die nedersettingspatroon in die distrik is een van redelike verspreiding met 'n hoë konsentrasie van dorpe in die ooste en suide. Mynbou, topografiese eienskappe, stamgrond en belangrike vervoerkorridors speel 'n rol in die nedersettingspatroon. Verdigting vind plaas in sommige sentrums, met inbegrip van Lephalale, Mokopane, Thabazimbi en Bela-Bela.

Padverbindings is redelik goed gevestig in die Waterbergdistrik. Hierdie verbindings sluit in die N1, N1-R33, R510 en die R516. Met die uitsondering van die N1, wat 'n tolpad is, word die R-roetes nie goed in stand gehou nie. Baie van die roetes het so ver gedeterioreer dat dit gevaarlik is om daarop te ry.

Hoewel daar 'n spoorverbinding tussen Lephalale en Thabazimbi is, sal dit opgegradeer moet word om die kapasiteit te vergroot. Dit

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sal dan moontlik wees om steenkool per spoor te vervoer in plaas van per pad, wat tans die geval is.

Belangrike dorpe soos Thabazimbi, Lephalale, Bela-Bela, Modimolle en Mokopane het vliegvelde vir ligte vliegtuie. Daar is tans geen kommersiële vlugte nie.

Die ontwikkeling in Lephalale sal hoër eise aan die waterhulpbronne van die gebied stel. Die Mokolo- en Laer-Krokodil-wateraanvullingsprojek is in werking gestel om te help om die gebrek aan water die hoof te bied. Die projek sal in drie fases geïmplementeer word. Die eerste fase behels die konstruksie van pypleiding wat parallel aan 'n bestaande pypleiding sal loop. Die tweede fase behels die oordragskema van die Krokodilrivier by Vlieëpoort naby Thabazimbi na die Lephalalegebied. Die laaste fase behels bottelnekverwydering. Dit behels die konstruksie van die eerste 9 kilometer van die voorgestelde gravitasiepypleiding (vir fase 1) met tussenverbindinge na die bestaande pypleiding (Exxaropypleiding).

Afvalbestuur in die Waterbergdistrik bied verskeie uitdagings. Daar is ook verskeie probleme en uitdagings in verband met dienslewering. Sanitasie en rioolvuilbehandeling is van besondere belang. Die Groendrupperverslag belig die swak toestand van vuilwaterbehandelingsaanlegte in die Waterbergdistrik.

Die Waterbergdistrik se Ruimtelikeontwikkeling-raamwerk se voorstelle vir ontwikkeling draai om bestaande strukture. Die Raamwerk erken ook die belangrikheid van eksterne skakels, veral in verband met landbou en bewaring.

## DEEL B: STRATEGIESE OMGEWINGSBESTUURSPLAN

### Sleutelkwessies

Die sleutelkwessies vir hierdie projek is in drie stadiums geïdentifiseer. In die eerste fase is die sleutelkwessies deur die projekspan geïdentifiseer voordat die proses van openbare deelname begin het. In die tweede fase is kwessies geïdentifiseer wat tydens die eerste rondte van openbare deelname ontstaan

het. Tydens die derde fase is bykomende en hardnekkige kwessies geïdentifiseer wat tydens die tweede rondte van openbare deelname ontstaan het.

Kwessies is onder die volgende hoofde gekategoriseer:

- Besikbaarheid en gebruik van water
- Watergehalte en -besoedeling
- Luggehalte
- Geraas
- Geaardheid van die Waterbergdistrik
- Waterbergbiosfeerreservaat
- Brandhout
- Verandering van bevolkingstruktuur en sosio-ekonomiese toestande
- Diensinfrastruktuurbehoefte
  - Paaie
  - Telekommunikasie
  - Elektrisiteit
  - Water en riolering
  - Onderwys en vaardigheidsopleiding
  - Afvalverwerking
- Regering
- Beplanning en ontwikkeling.

### Verlangde Toestand

Hierdie afdeling toon wat vir die verskillende sektore belangrik is soos dit deur deelnemers aan die belanghebbende- en die openbaredeelname-proses meegedeel is.

Al die sektore het 'n behoefte aan verbeterde diensinfrastruktuur uitgespreek. Daar word ook algemeen verwag dat hierdie verbeterings oor die kort termyn die regering se bydrae tot die ekonomiese ontwikkeling van die gebied moet wees.

Die wildboerderygemeenskap word verteenwoordig deur verskeie subgroepe wie se aktiwiteite bepaal word deur die "markte" waarin hulle werk, elk met sy eie behoeftes.

As gevolg van die streng regulasies wat geld, is baie wildboere (nie almal nie) van mening dat daar onbillik deur die regering teen hulle gediskrimineer word, wat hulle bedryf onnodig moeilik en duur maak, in so 'n mate dat dit moeilik word om te funksioneer.

Die Waterbergdistrik het 'n oorfloed van landskap- en biologiese en kulturele eienskappe om aan te bied, met die potensiaal om 'n hoëgehalte-toerismeproduk vir 'n verskeidenheid van markte aan te bied. Dit is ook baie gunstig geleë ten opsigte van Gauteng, wat dit 'n ideale gebied maak vir 'n naweekwegbreek of 'n kort vakansie.

Daar is 'n behoefte aan 'n sterk regeringgesteunde "Waterberghandelsmerk" wat die gebied as 'n geheel en as 'n bestemming bemark.

Die uitbreiding van bewaring fokus op die Waterbergbiosfeerreservaat en die uitbreiding daarvan na privaat eiendom. Daar is baie min openbare belegging in die uitbreiding van bewaringsgebiede en die bewaringsowerhede fokus dus op die streng bestuur van ontwikkeling en veranderinge op privaat grond wat 'n negatiewe uitwerking op die natuurlike omgewing kan hê.

Landbou in die gebied is belangrik vir die produksie van voedsel vir die groeiende markte in dele van die distrik en ook vir markte in die nabygeleë Gauteng. Hierbenewens is landbou die belangrikste werkverskaffingsektor in die distrik en as sodanig het dit 'n belangrike funksie in die sosiale struktuur van die gebied. Om hierdie redes is dit belangrik dat die huidige landboupraktyke, veral intensiewe landbou, in stand gehou word en in die toekoms na bykomende hoëpotensiaal-landbougrond uitgebrei word.

Mynbou is die hoeksteen van die distrik se ekonomie en dra tans meer as 50% tot die BBP van die gebied by. Dit is hoogs onwaarskynlik dat hierdie bydrae oor die volgende 60 tot 100 jaar

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sal afneem. Oor die medium tot lang termyn is die mynbedryf dus belangrik vir die ontwikkeling van die distrik.

Daar is 'n desperate behoefte aan duidelikheid oor die regering se langtermynplanne in verband met die verdere ontwikkeling van die Waterbergsteenkoolveld, veral met betrekking tot die ontwikkeling van elektrisiteit en moontlike vloeistof-uit-steenkoolprosesse. Ondernemings van die regering om voldoende water, vervoerinfrastruktuur en ander noodsaaklike infrastruktuur te voorsien, is ook nodig om privaat ondernemings se risiko te verminder en om behoorlike beplanning moontlik te maak.

## Sensitiwiteitsontleding

Die sensitiwiteitsontleding saam met die strukturele ruimtelike elemente (dorpe, mineraalhulpbronne, ekonomiese aktiwiteite, ens.) wat in die status quo-stadiums en die Verlangdetoestand-verslag geïdentifiseer is, voorsien die grondslag vir die ontwikkeling van omgewingbestuursones (volgende afdeling).

Met die bevindinge in die Verlangdetoestand-verslag as grondslag, is daar besluit om die volgende aspekte verder te ontleed om 'n ruimtelike grondslag te verfyn wat relevant en akkuraat vir die identifisering van omgewingbestuursones sal wees:

- Algemene omgewingsensitiwiteit (ekologies en landskap)
- Bewaringsbeplanning (huidige beskermde gebiede en potensiële uitbreidingsgebiede)
- Waterproduksieprioriteitsgebiede
- Landbou-intensiteit (voetspoor)

## Omgewingbestuursones

Aanvanklik is die omgewingbestuursones (OBS) vir die Waterbergdistrik se OBR vasgestel deur die noukeurige evaluering van die status quo-insette en veral die omgewingsensitiwiteit- en ander prioriteitsbehoefte in die gebied wat in die vorige afdeling van die verslag beskryf is.

Hierdie omgewingbestuursones vir die Waterberg is hersien en verfyn, met die volgende as grondslag:

- Terugvoer van belanghebbende en belanghebbende en geaffekteerde partye oor die Konsepverlangdetoestand-verslag
- Terugvoer en insette ontvang tydens 'n werkwinkel met munisipale amptenare
- Terugvoer en insette ontvang tydens 'n werkwinkel met nasionale en provinsiale owerhede
- Terugvoer en insette ontvang van belanghebbende en geaffekteerde partye oor die konsepomgewingbestuursones
- 'n Grondige assessering van die breër streekskonteks, met inbegrip van waarskynlike aktiwiteite in Botswana.

Die afdeling gee 'n kort beskrywing van elke OBS, 'n beskrywing van die verlangde toestand van elke OBS asook 'n aanduiding van voorkeur-, versoenbare en ongewenste aktiwiteite in elke OBS.

Die volgende omgewingbestuursones is geïdentifiseer:

- Sone 1: Beskerming van natuurlike plantegroei, skilderagtige landskappe en rotstekeninggebiede, met beperkte toepaslike toerisme
- Sone 2: Fokusgebiede vir natuur- en kultuurtoerisme met 'n hoëgehalte natuurlike omgewing
- Sone 3: Wild- en beesboerderygebiede (jag ingesluit) met 'n kommersiële fokus
- Sone 4: Mynboufokusgebiede
- Sone 5: Fokusgebied vir potensiële groot nywerheid- en verwante aktiwiteite
- Sone 6: Fokusgebiede vir beperkte mynbou in estetiese en/of ekologiesehulpbron-gebiede
- Sone 7: Verstedelikingfokusgebiede en -nodusse
- Sone 8: Landelike nedersettinggebiede

- Sone 9: Landboufokusgebiede met 'n toerismekomponent
- Sone 10: Landbougebiede met 'n kommersiële fokus
- Sone 11: Belangrike infrastruktuurkorridors.

Die toepassing van die Wet op Nasionale Omgewingsbestuur en die Omgewingsimpakassesseringsregulasies met betrekking tot die sensitiewe sones 1 en 2 word ook uiteengesit.

## Riglyne vir omgewingsbestuur

Ten einde leiding in sekere belangrike omgewingskwessies te gee, word riglyne vir die volgende kwessies ingesluit:

- Bestuur en hersikling van vaste afval
- Rioolvuilwegdoening
- Grondtransformasie
- Versorgingsplig en remediëring van skade aan die omgewing
- Kompenserende belegging
- Stroomvloeibestuur.

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# Waterberg District Environmental Management Framework Report

## ABBREVIATIONS

APPA	Atmospheric Pollution Prevention Act
ARC – ISCW	Agricultural Institute for Soil, Climate and Water
BOD	Biochemical Oxygen Demand
CDM	Capricorn District Municipality
CR	Critically endangered ecosystem
CTL	Coal-to-liquids
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry (now Department of Water Affairs)
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMZ	Environmental Management Zones
EN	Endangered ecosystem
GDP	Gross Domestic Product
GGP	Gross Geographic Production
GVA	Gross Value Added
HIA	Heritage Impact Assessment
IDP	Integrated Development Plan
ITP	Integrated Transport Plan
IUCN	International Union for Conservation of Nature
IWMP	Integrated Waste Management Plan
LCF	Lephalale Coal Field
LED	Local Economic Development Plan
LEDET	Limpopo Department of Economic Development, Environment and Tourism

Ma	Million years ago
MAR	Mean Annual Runoff
MEC	Member of the Executive Council
NEMA	National Environmental Management Act
RAL	Roads Agency Limpopo
RAMSAR	Ramsar International Convention on Wetlands
RSA	Republic of South Africa
S	South
SANRAL	South African National Roads Agency
SDF	Spatial Development Framework
SE	South East
SW	South West
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VU	Vulnerable ecosystem
WD	Waterberg District
WDM	Waterberg District Municipality
WMA	Water Management Areas
WSPs	Water Service Providers
WWTW	Waste Water Treatment Works

## GLOSSARY OF TERMS

**Arable land** means land that is fit to be cultivated.

Azonal vegetation means vegetation that occurs in between terrestrial and aquatic habitats.

**Biodiversity** means the totality of genes, species, and ecosystems of a region.

**Endemism** means a species that is prevalent in or peculiar to a particular locality. Endemism is the ecological state of being unique to a particular geographic location, such as a specific island, habitat type, nation or other defined zone. To be endemic to a place or area means that it is found only in that part of the world and nowhere else.

**Escarpment** means a steep slope or long cliff that results from erosion or faulting and separates two relatively level areas of differing elevations.

**Long term** means at least a hundred years from now.

**Mean Annual Runoff (MAR)** means the total amount of surface water within a catchment area and can consist of runoff from precipitation falling within that area, and water flowing into that area from adjacent areas. The total amount of water in that area is referred to as the mean annual runoff (MAR). MAR can also be defined as the average annual stream flow passing a specific point or the maximum average annual flow observed in a river basin.

**Non-perennial** means something that does not last through the year.

**Overgrazing** means to permit animals to graze (vegetation cover) excessively, to the detriment of the vegetation and so that it no longer provides nourishment.

**Plateau** means an area of highland, usually consisting of relatively flat terrain.

**Sediment** means solid fragments of inorganic or organic material.

**Topography** means a representation, usually graphic of the surface features of a place or region on a map indicating their relative positions and elevations.

**Undulating** means moving up and down like waves or forming a series of regular curves.

## **PART A: INTRODUCTION AND SUMMARY OF THE STATUS QUO REPORT**

# Waterberg District Environmental Management Framework Report

## 1. INTRODUCTION

### 1.1. BACKGROUND

Environomics and NRM Consulting were appointed by the national Department of Environmental Affairs (DEA) in partnership with the Limpopo Department of Economic Development, Environment and Tourism (LEDET), and the Waterberg District Municipality (WDM) to undertake the compilation of an Environmental Management Framework (EMF). The EMF will support decision-making in the Waterberg District Municipality area in order to facilitate appropriate and sustainable development.

The EMF must:

- Identify the geographical area to which the EMF applies;
- specify attributes of the environment in the area including the sensitivity, extent interrelationship and significance of those attributes;
- identify any parts in the EMF area to which the specified attributes relate;
- state the conservation status of the area and/or its relevant parts;
- state the environmental management priorities in the area;
- indicate the kind of activities that would have a significant impact on the attributes in the area and those that would not;
- indicate activities that would be undesirable in the area or in specific parts of the area; and
- meet any other requirement specified by the Minister or MEC.

### 1.2. THE ENVIRONMENTAL MANAGEMENT FRAMEWORK AREA

The EMF area comprises of the Waterberg District Municipality area. It covers approximately 49 523 km<sup>2</sup>. It is the largest district in the Limpopo Province.

It contains 6 local municipalities, namely:

- Bela-Bela
- Lephalale
- Modimolle
- Mogalakwena
- Mookgopong
- Thabazimbi

#### Western Waterberg Escarpment

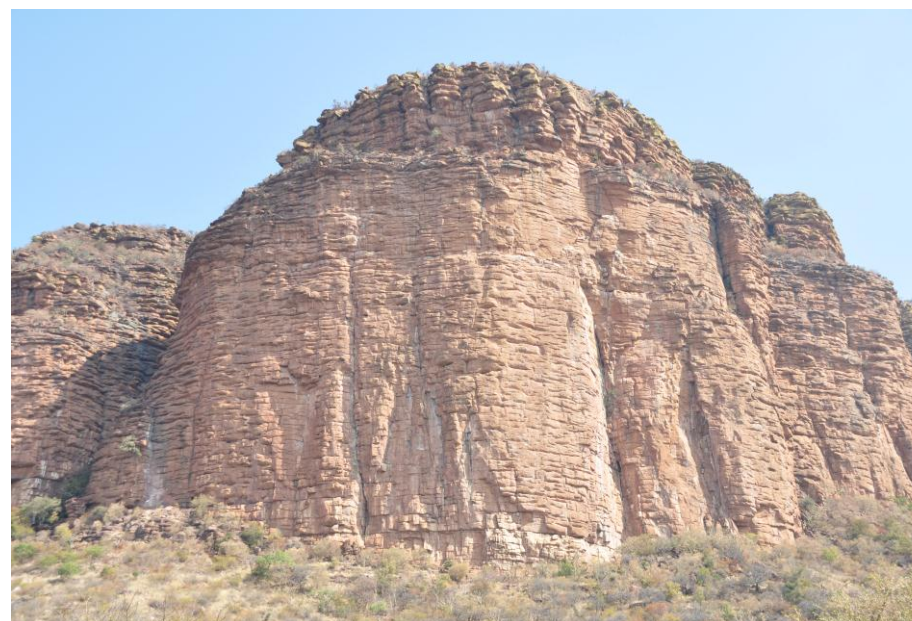


Photo: S. Taljaardt

### 1.3. THE PURPOSE OF THE EMF

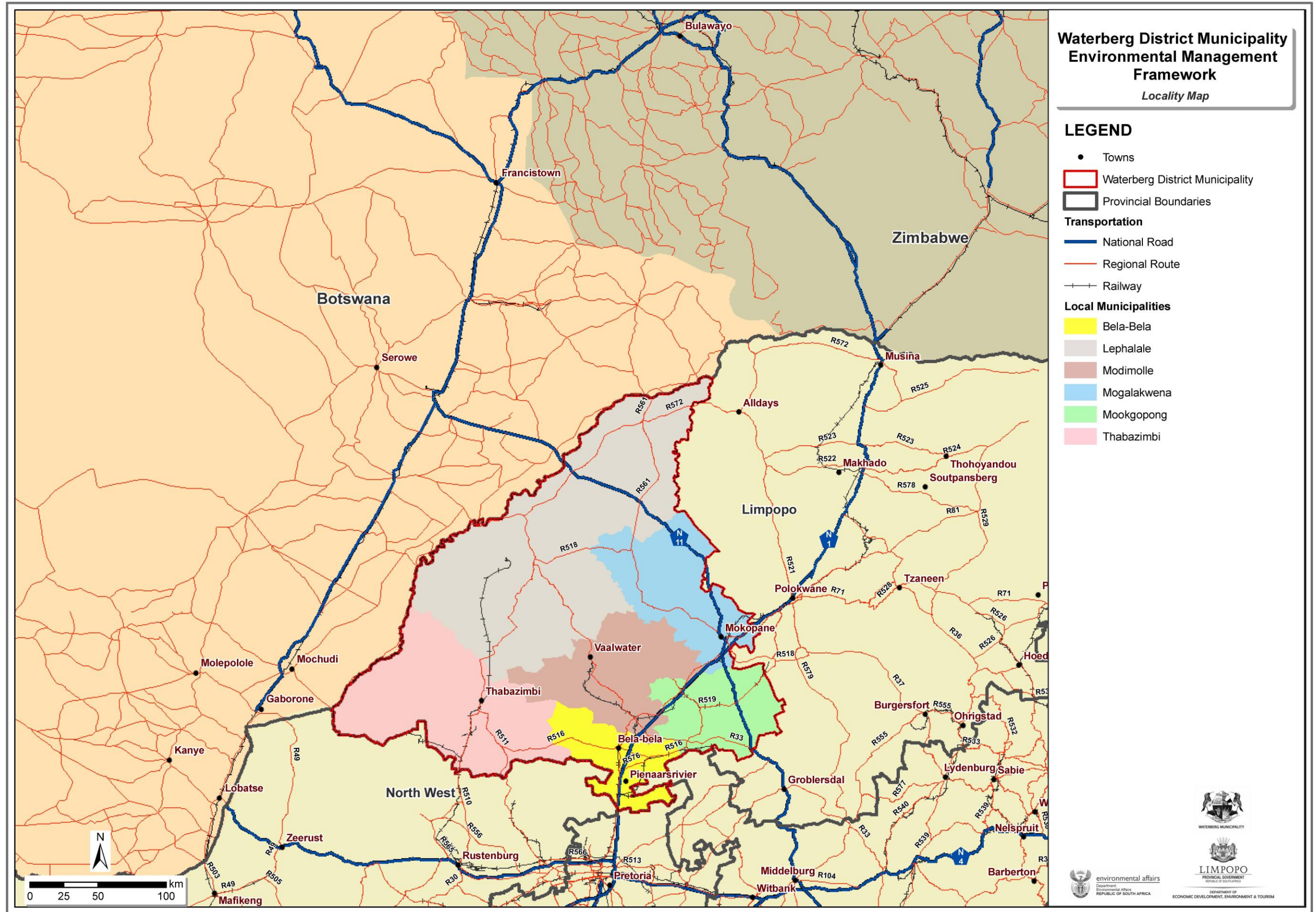
The purpose of this EMF is to develop a framework that will integrate policies and frameworks, and align different government mandates in a way that will streamline decision-making to improve cooperative governance and guide future development in an environmentally responsible manner.

The specific objectives of the EMF include:

- Encourage sustainable development;
- establish development priorities;
- identify strategic guidance and development management proposals;
- identify the status quo, development pressures and trends in the area;
- determine opportunities and constraints;
- identify geographical areas in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- specify additional activities within identified geographical areas that will require EIA based on the environmental attributes of such areas;
- specify currently listed activities that will be excluded from EIA within certain identified geographical areas based on the environmental attributes of such areas; and
- develop a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.

# Waterberg District Environmental Management Framework Report

Map 1: Locality Map



# Waterberg District Environmental Management Framework Report

## 2. GEOLOGY

The geology of the Waterberg District forms the foundation for the development of the landscape, soils and vegetation cover that developed upon it over millions of years. It is also the source of minerals that form the backbone of the economy of the district.

### 2.1. GEOLOGICAL SYSTEMS<sup>1</sup>

The geological systems that occur in the EMF area are depicted in a simplified format on Map 2: Geological Systems. These systems are described in brief below. For a full description please refer to the Status Quo Report.

#### 2.1.1. The Transvaal Super Group

The Transvaal Super Group consists of clastic<sup>2</sup> and chemical sediments and volcanic rocks which were laid down in a basin elongated in an east-west direction and rest conformably on older Swazian rocks.

#### 2.1.2. Karoo Super Group

The Karoo Super Group is subdivided into four “series” namely, the Dwyka, Ecca, Beaufort and Stormberg. The Karoo Sequence is made up out of sedimentary rocks and consists of:

- The main Karoo basin, which extends from the Western Cape Province eastwards to the Indian Ocean, and northwards into Limpopo;
  - The Lebombo area (outside the EMF area);
  - The Sprinbok Flats to the east of Modimolle, overlying rocks of the Bushveld Igneous Complex, and coal bearing especially in the area of Nylsvley (within the EMF area);
- and

- The Waterberg coalfield directly to the north east and west of Lephalale.

The sequence was deposited in a vast intracratonic basin, which attained its maximum depth in the south, with a few satellite basins to the north.

#### 2.1.3. Waterberg Group

The Waterberg basin is bounded on the southern side by the Waterberg and Sandriviersberg, and stretches northwards for roughly 90 km up to Lephalale, where it is bounded on the northern side by Karoo rocks, the contact being a fault. There is an offshoot towards the west, into Botswana, and another towards the north, up to the Blouberg.

Sedimentological studies performed on rocks of the Waterberg Group point towards the Transvaal Sequence and the Bushveld Complex as the more important source rocks. The material was transported essentially from the north by an active river system which had migrated over a flood plain, some 40 km wide. Arid conditions during which material could have been transported and deposited by wind action, could therefore have developed locally.

The age of the group is approximately 1 700 Ma. It is based on the fact that the Palala Granite, with an age of 1 770 Ma, is displaced by the Abbottspoor fault, but this fault does not affect the Makgabeng Formation, a part of the Waterberg Group, nearby, which means that the Makgabeng Formation is younger than 1770 Ma.

#### 2.1.4. Bushveld Igneous Complex

This complex is the largest layered complex in the world and covers an area of nearly 65 000 km<sup>2</sup>. In addition to its scientific importance, it also harbours important sources of platinum and chromium.

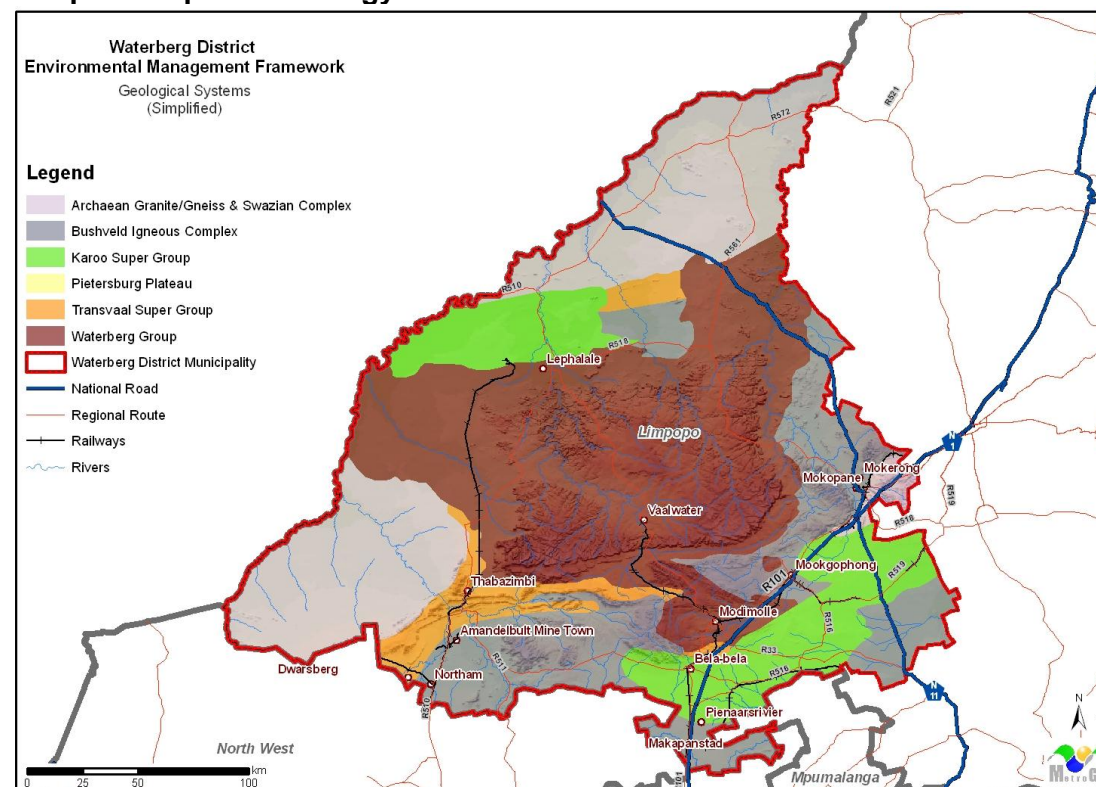
The four lobes comprise an eastern lobe stretching from Belfast in the south up to the environs of Chuniespoort; a western lobe stretching from Pretoria via Rustenburg and the Pilansberg up to Thabazimbi (partly within the EMF area); a southern lobe which is largely covered by Karoo rocks but stretches as far south as Argent, Bethal and Hendrina, and a northern lobe stretching from Mokopane (within the EMF area) to the vicinity of Villa Nora. The four lobes are arranged around two axes, each approximately 350 km in length and orientated in north-north west and east-north-east

directions respectively. The basic rocks crop out all along the peripheries of these lobes.

#### 2.1.5. Archaean Granite/Gneiss & Swazian Complex

The Limpopo Depression to the south-west of the Waterberg and to the north of the Waterberg consists almost entirely of Old Swazian Granite and Gneiss formations. The Maladrift Group which is part of the Beit Bridge Complex is the most dominant in the area and is made up of lucocratic quartz-feldspar gneiss which also contains garnet and amphibole, together with interbeds of pink hornblende gneiss.

Map 2: Simplified Geology



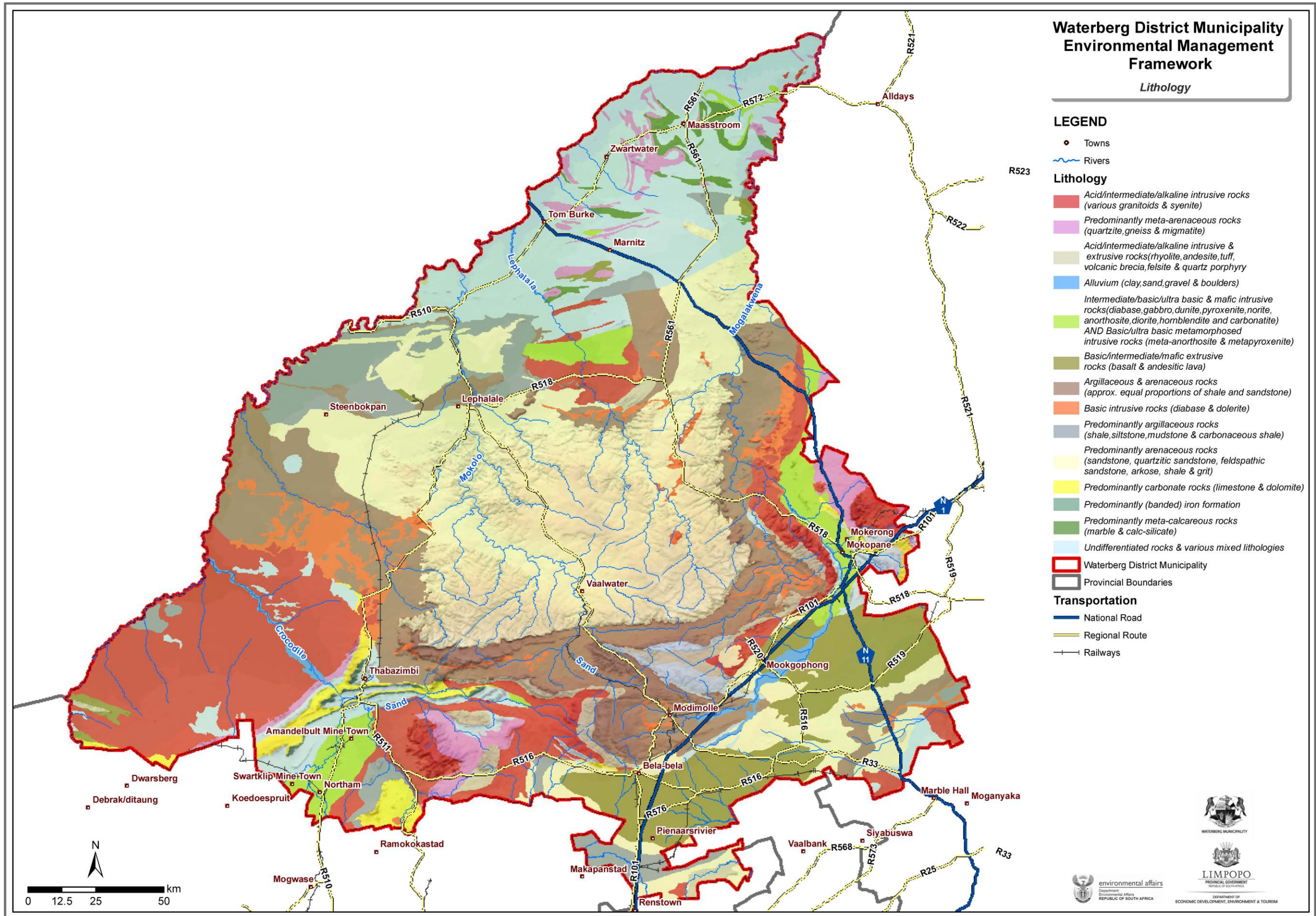
<sup>1</sup> The main source of information used in this section is: D.J.L. Visser, 1989. *The Geology of the Republics of South Africa, Transkei, Bophuatswana, Venda, Ciskei and the Kingdoms of Lesotho and Swaziland*. Geological Survey, Republic of South Africa.

And T. McCarthy, B. Rubidge. 2005. *The Story of Earth & Life, A southern African perspective on a 4.6-billion-year journey*. Kumba Resources. Johannesburg.

<sup>2</sup> **Clastic rock** means a rock composed of broken pieces of older rocks.

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Map 3: Lithology



# Waterberg District Environmental Management Framework Report

## 2.2. DOMINANT ROCK TYPES<sup>3</sup>

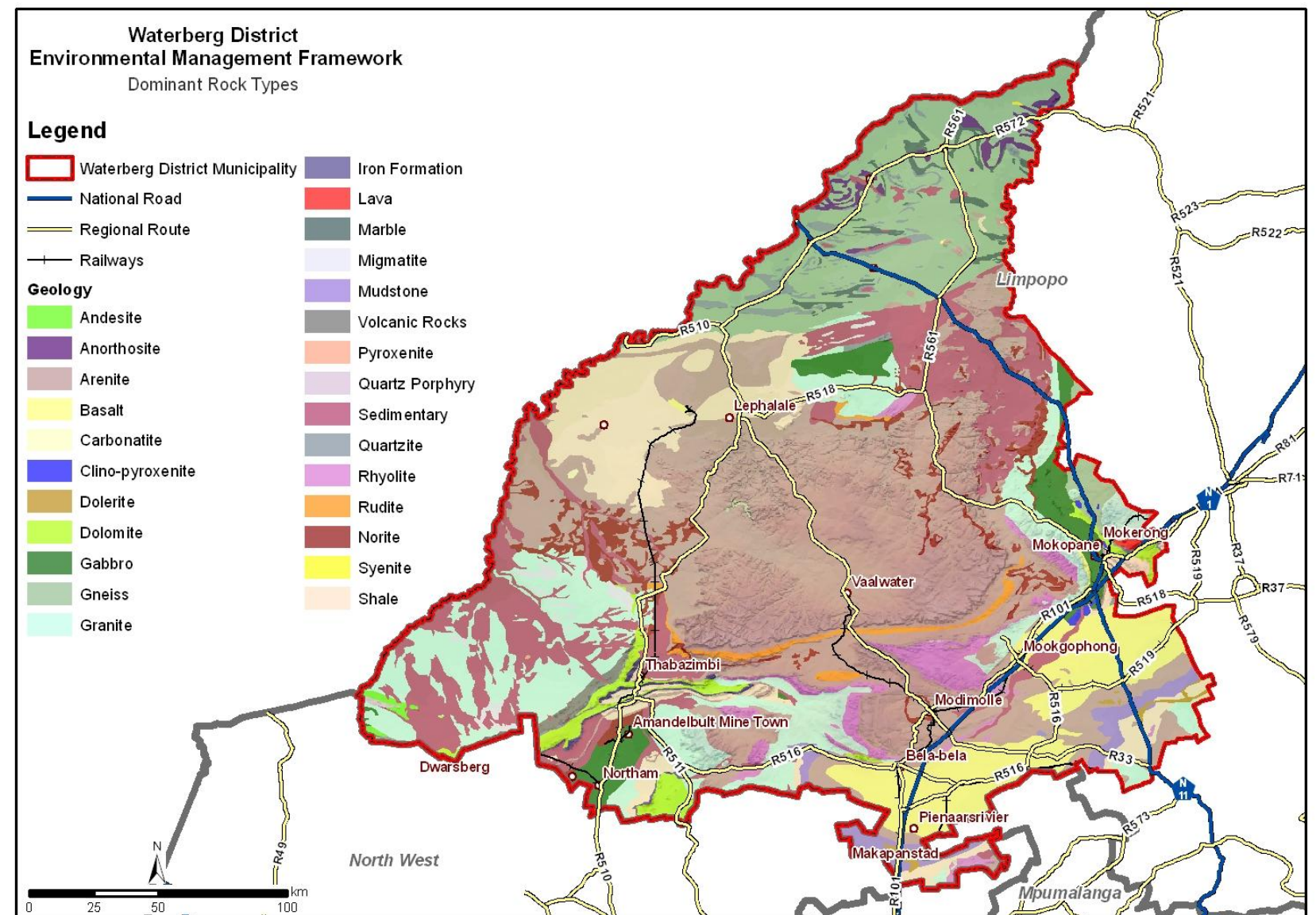
Dominant rock types in the EMF are indicated on Map 4: Dominant Rock Types and described in full in the Status Quo Report.

- Andesite** Andesite is the volcanic equivalent of diorite, occurring as a dark-coloured and fine-grained but rarely glassy rock in lava flows and minor intrusions.
- Anorthosite** Anorthosite is a light coloured gabbro, which consists essentially of calcic feldspar, usually labradorite or bytownite, containing only a little augite and hypersthene, or occasionally olivine. It occurs as distinct layers in gabbroic intrusions, or as a large intrusive mass on its own.
- Arenite** Arenite a sedimentary clastic rock with sand grain size between 0.0625 mm (0.00246 in) and 2 mm (0.08 in). Arenites mainly form by erosion of other rocks or turbiditic re-deposition of sands. Some arenites contain a varying amount of carbonatic components and thus belong to the rock-category of carbonatic sandstones or silicatic limestones.
- Basalt** Basalt is the fine-grained equivalent of gabbro or dolerite, and occurs as lava flows and minor intrusions, particularly dykes. Basalts are usually very fine-grained but still crystalline rocks, often appearing dull on fractured surfaces. They are commonly dark grey or even black in colour when fresh, and often weather to a brownish crust, rich in hydrated iron oxides.
- Carbonatite** Carbonatites are intrusive or extrusive igneous rocks defined by mineralogic composition consisting of greater than 50 percent carbonate minerals. Carbonatites may be confused with marble, and may require geochemical verification.
- Dolerite (Diabase)** Dolerite is the medium-grained equivalent of gabbro, composed essentially of calcic plagioclase and pyroxene in roughly equal amounts, giving it a mottled appearance. It occurs very widely as large dykes, thick sills and volcanic plugs.
- Dolomite** Dolomite is very similar to calcite, lacking any distinctive features unless it occurs as rhombohedral crystals with curved faces, together with haematite. Often found as a vein mineral. Dolomite can be difficult to distinguish from limestone.
- Gabbro** Gabbro is a rather dark coloured, coarse-grained igneous rock of basic composition. It is typically composed of calcic plagioclase and pyroxene in roughly equal amounts. So that the rock consists of light and dark minerals.
- Gneiss** Gneiss is a coarse-grained metamorphic rock which lacks a well-developed schistosity, but which displays a distinct banding or layering on a small scale.
- Granite** Granite is a coarse-grained igneous rock of acid composition and consists essentially of quartz (often in amounts much greater than 10%). Granites usually occur in pale shades of white, pink, red or grey.
- Iron formation** Iron-rich sedimentary rocks, mostly of Precambrian age, containing at least 15% iron.
- Lava** This is molten rock expelled by a volcano during an eruption. This molten rock is formed in the interior of Earth, When first erupted from a volcanic vent, lava is a liquid at temperatures from 700 °C to 1,200 °C. Lava can flow great distances before cooling and solidifying. The type of eruption, non-explosive or explosive also influences the formation of this rock.
- Marble** Marble is a metamorphosed limestone, still consisting chiefly of calcite although other minerals may be present. It typically displays a rather granular texture. Marble is usually a whitish or greyish rock, particularly the ornamental varieties used for statuary, but its colour can vary greatly, depending on what impurities in the rock.

- Migmatite** Migmatite is the name given to any coarse-grained gneiss or schist that consists of a metamorphic host-rock, penetrated in a very intricate fashion by irregular and often discontinuous veins of granitic material.
- Shales and Mudstone** Shales and mudstones are extremely fine-grained sedimentary rocks, mostly consisting of clay particles less than 1/256 mm in diameter. Clay particles usually settle out in still water as mud, which gets compressed by sedimentary rock, converting it to mudstone or shale.
- Volcanic Rocks** Volcanic rocks are usually fine-grained or aphanitic to glass in texture. Volcanic rocks are named according to both their chemical composition and texture.
- Pyroxenite (Pyroxene-granulite)** Pyroxenite is a coarse-grained basic rock. They are found exposed in basement complexes, representing the deepest levels of the continental crust.
- Quartz Porphyry** Quartz porphyry is an intrusive rock of granitic composition. These rocks are typically light-coloured, especially on weathered surfaces, appearing greyish or sometimes as a striking pink or red.
- Sedimentary rocks** Sedimentary rock is a type of rock that is formed by sedimentation of material at the Earth's surface and within bodies of water. Before being deposited, sediment was formed by weathering and erosion in a source area, and then transported to the place of deposition by water, wind, mass movement or glaciers.

- Quartzite** Quartzite is a metamorphic rock composed almost entirely of quartz, formed by the recrystallization of a quartz-rich sandstone, and consisting of an interlocking mosaic of quartz grains, all tightly welded together. Quartzites are usually white or pale grey, but sometimes pink or even reddish.
- Rhyolite** Rhyolite is the volcanic equivalent of granite, forming a very fine-grained rock of acid composition, which typically occurs as lava flows, often of considerable thickness.
- Rudite** Rudite is any sedimentary clastic rock with a grain size exceeding 2 mm (0.08 in) such as conglomerates and breccias. The term is used in the classification of clastic carbonatic limestones, although the granulometrically equivalent terms conglomerate and breccia are often used for limestone too.
- Norite** A coarse-grained, basic igneous rock. Norites, like gabbros, are found as layers in many large, layered basic intrusions, as well as forming intrusions in their own right.
- Syenite** Syenite is a light-coloured, coarse-grained igneous rock. Syenite differs from granite in the lack of quartz, which always makes up less than 5% of the rock.

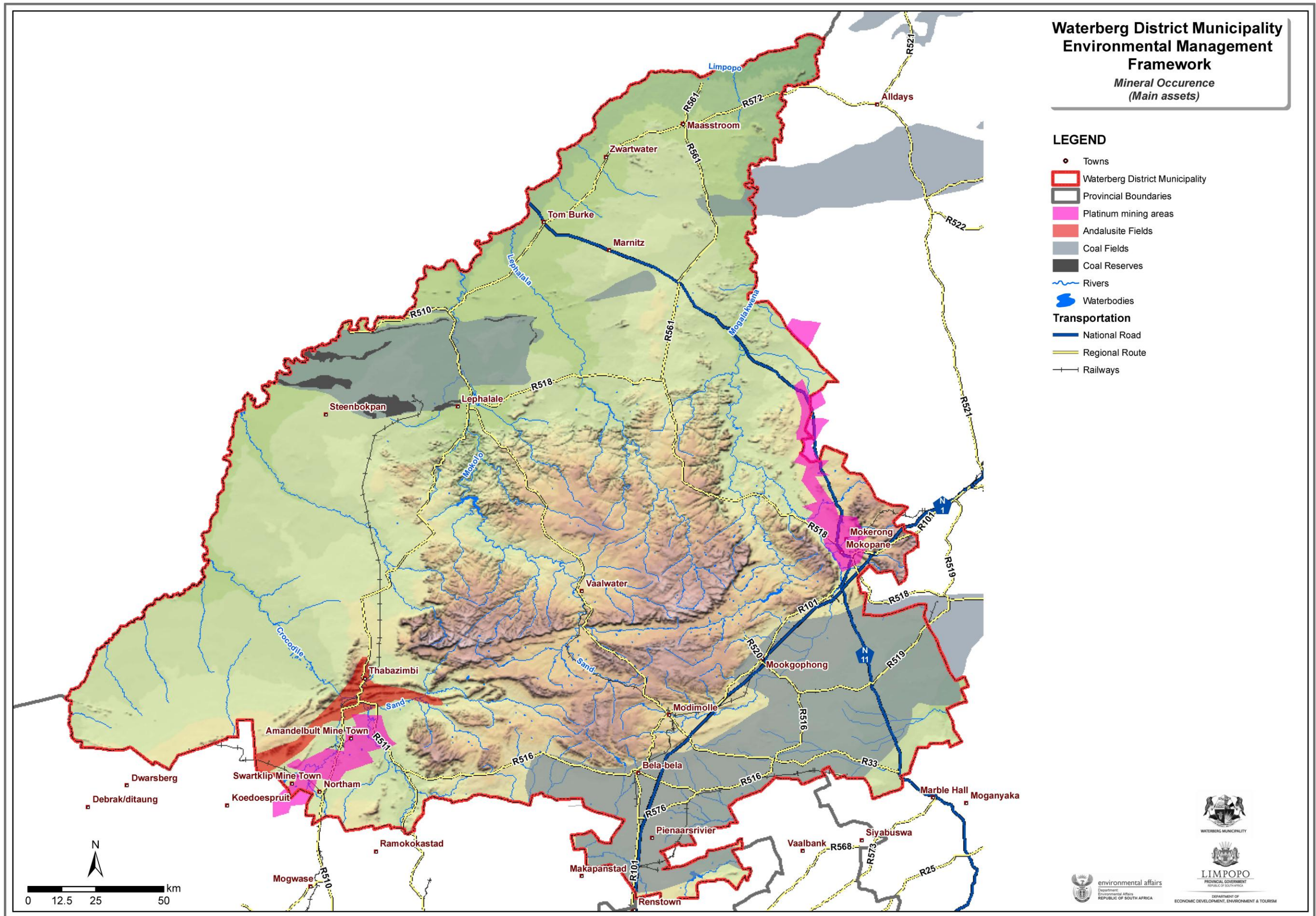
Map 4: Dominant Rock Types



<sup>3</sup> The main source of information used in this section is: Roberts J.L., 1998. *A Photographic Guide to Minerals, Rocks and Fossils*. New Holland Publishers (UK) Ltd

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Map 5: Mineral Occurrence



# Waterberg District Environmental Management Framework Report

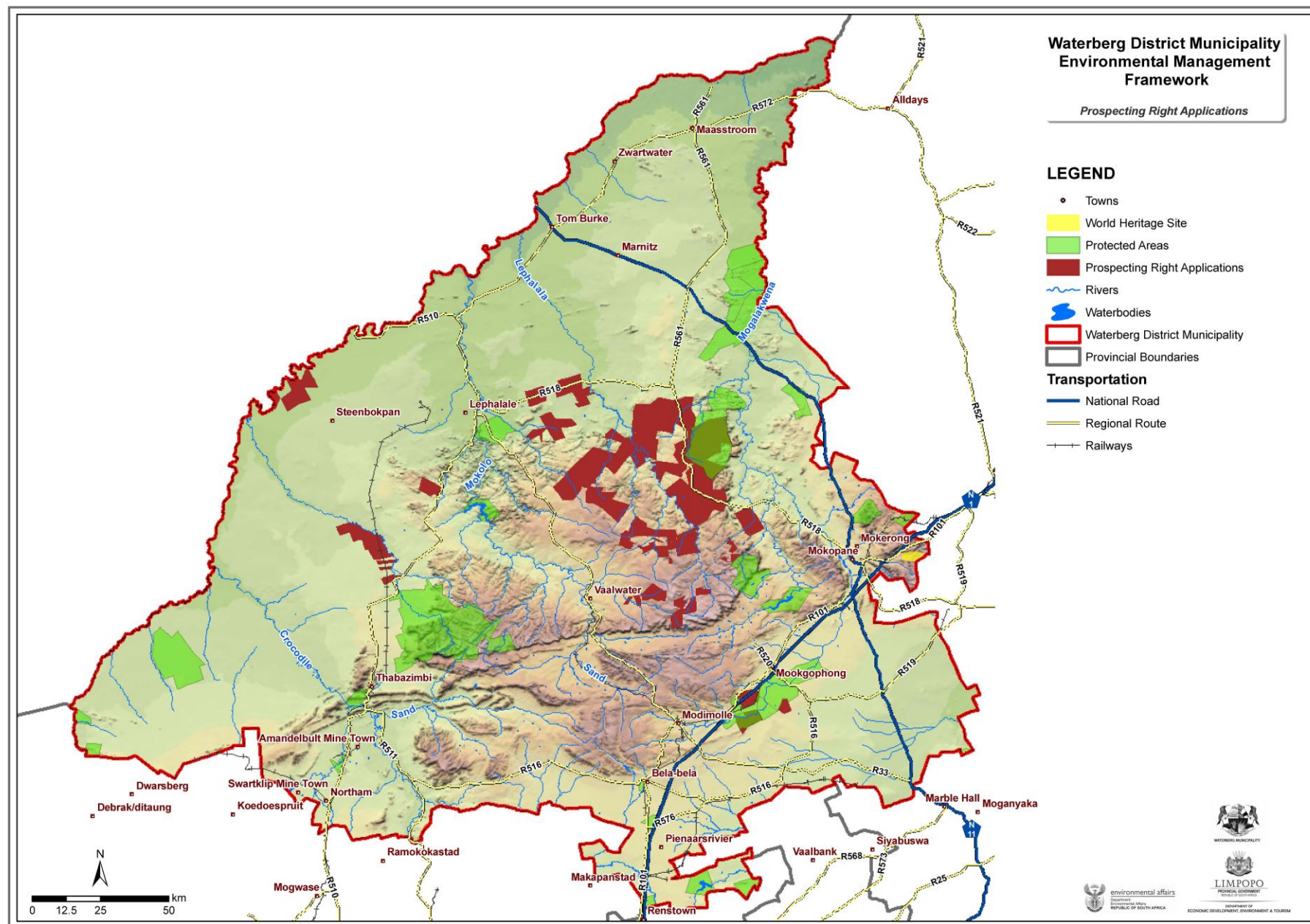
## 2.3. MINERAL POTENTIAL

The mineral potential of the area is closely related to the geological systems. The Bushveld igneous complex, especially in its periphery, contains significant mineral deposits including Platinum Group metals, tin, chromium and granite.

Iron ore occurs in the Transvaal Supergroup in the vicinity of Thabazimbi. Extensive coal reserves occur in the layers of the Karoo Super Group both between Lephalale and the Botswana border and in the Nylsvlei area where there are several new applications for mining.

Map 6 indicates the areas where prospecting rights applications have been received.

Map 6: Prospecting Rights Applications



Grootegeluk Mine, with Matimba Power Station



Photo: S. Taljaardt

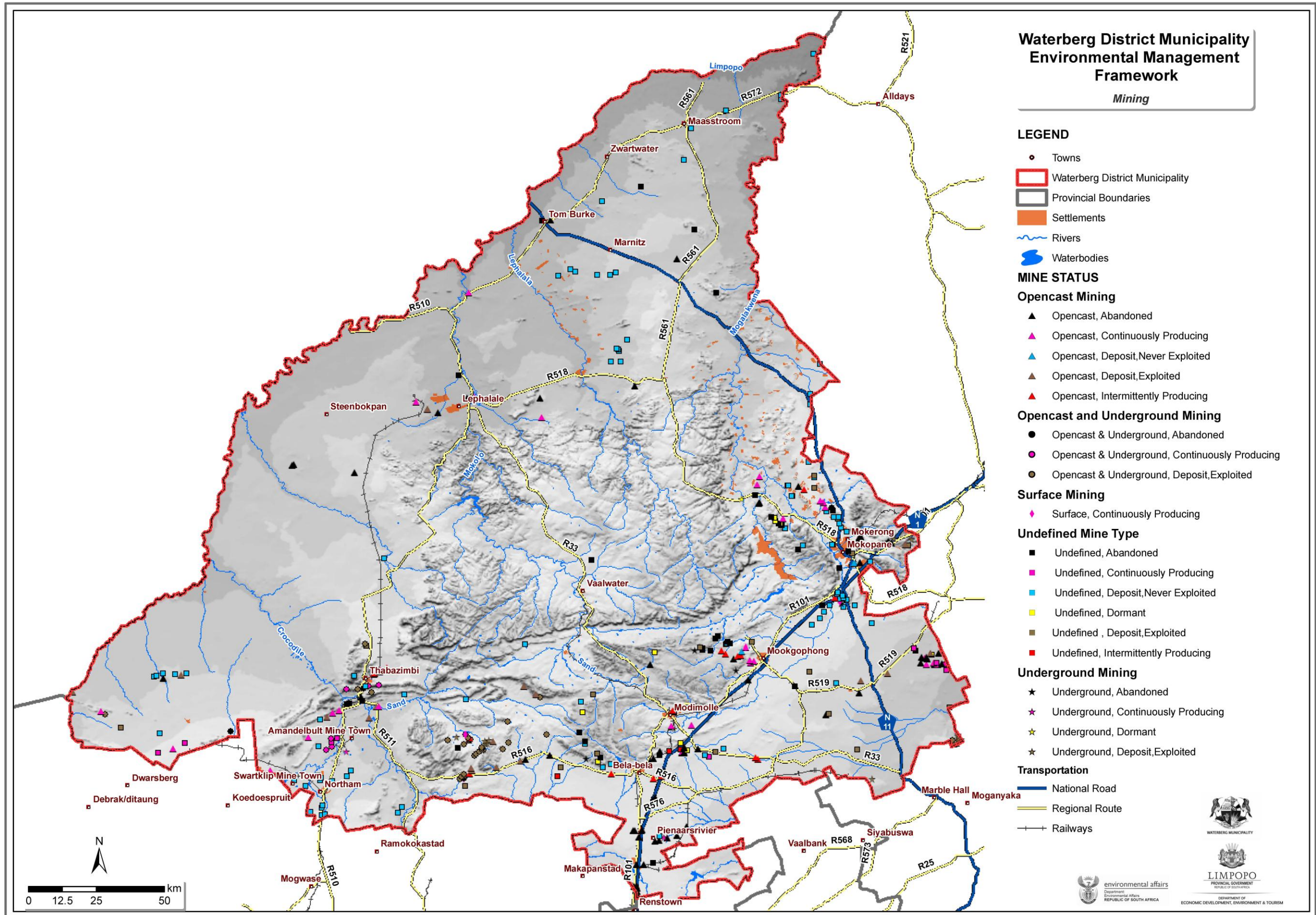
Grootegeluk Mine,



Photo: S. Taljaardt

# Waterberg District Environmental Management Framework Report

Map 7: Mining



# Waterberg District Environmental Management Framework Report

## 2.4. LANDSCAPE

The landscape of the Waterberg District is a unique feature that distinguishes it from any other place in South Africa. There are four main landscape features in the Waterberg District, namely the Waterberg Plateau, the Transvaal Plateau Basin, the Pietersburg Plain and the Limpopo Depression.

A full description of these features can be found in the Status Quo Report, while a brief summary can be found below.

### 2.4.1. The Waterberg Plateau

The Waterberg Plateau forms a highland area. The highest part of the area is in the south. Kransberg in the south-west towers out above the Limpopo Plain at the foot of the cliff-like escarpment made up of Waterberg Sandstone. The surface of the Waterberg Plateau declines gradually to the west, where a well-defined escarpment overlooks the peneplain<sup>4</sup> of the Upper Limpopo Valley.

### 2.4.2. The Transvaal Plateau Basin

The Transvaal Plateau Basin results primarily from the formation of Bushveld lopolith<sup>5</sup>. The region therefore falls naturally into two subdivisions, the basin floor and the periphery<sup>6</sup>. The area commonly known as the Springbok Flats forms the basin floor. The outer margin of the floor is predominantly flat but forms a discontinuous line of koppies and ridges where it is highly mineralised near its inner margin.

### 2.4.3. The Pietersburg Plain

A small part of the Pietersburg Plain lies to the east of the Waterberg Plateau. It is essentially a region forming part of the great South African Plateau but it lies at a lower level than the adjacent highlands.

### 2.4.4. The Limpopo Depression

The Limpopo Depression (valley) is a flat plain that lies in a broad depression. The sequence of events that formed the depression included a post-Waterberg uplift of the surface, the subsequent deposition of Karoo beds, transgressing the Waterberg in the south and the Old Granites in the north. In post-Karoo times the area was subjected to tensional stresses, which resulted in generally northwards sagging. It seems probable that the depression originated in these dislocations and that its extent was limited in the south by the Waterberg beds.

## 2.5. TERRAIN MORPHOLOGY AND AREAS WITH SPECIAL CHARACTER

The landforms in the area are dominated by the Waterberg Plateau. A morphological description of landscape of the area is depicted on Map 5: Terrain Morphology.

The Waterberg plateau has an overall character that despite the development of numerous lodges and disturbances such as landing strips still maintains a wilderness character. Similarly the wide open bushveld plains of the Limpopo Peneplain represent a special South African bushveld character. This area of pristine bushveld and small sleepy towns makes for a special character not found elsewhere in South Africa. This character is one of the key selling points that the tourism sector employs in their marketing strategy.

The escarpment is a unique feature of the Waterberg District. It is a valuable natural asset that has a lot of potential especially in the tourism sector. The valleys from which the escarpment can be viewed as well as the escarpment itself should be protected in some way to ensure that no development takes place there that could affect the character or sense of the place in a negative fashion.

The following morphological features are especially important from a “sense of place” perspective:

- The escarpment as the main topographical feature in the area;
- The enclosed plains from which the escarpment and other surrounding mountains can be viewed;
- The incised river valleys and hills where the wilderness experience is exemplified by the surrounding feeling of enclosure; and
- The high mountains, mountains and hills that give the Waterberg District its distinct visual character.

The maintenance of these landscape features is as important from a conservation perspective as sensitive biological features that should be maintained to ensure the long term ability of the landscape to attract tourist to the area.

The main threats to the landscape is:

- Open cast mining;
- Metallurgical industries associated with mining;
- Development of large inappropriate resort areas that does not take adequate account of the landscape; and
- The development of landing strips all over the place.

### Waterberg Escarpment

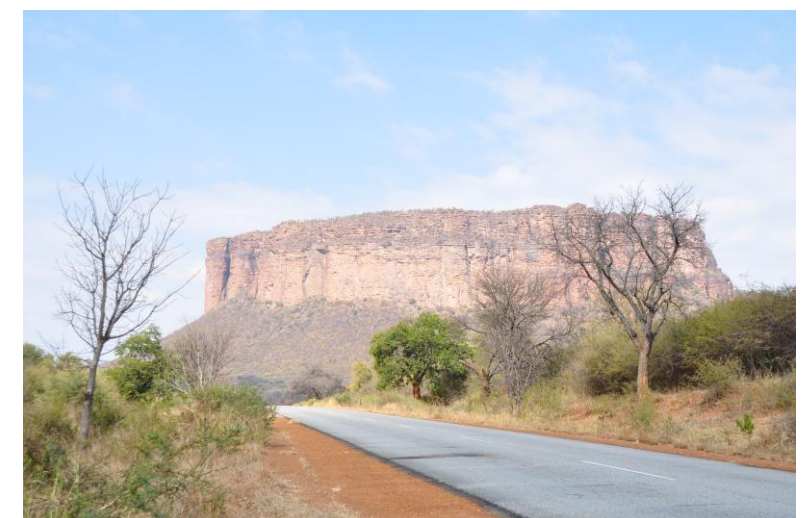


Photo: S. Taljaardt

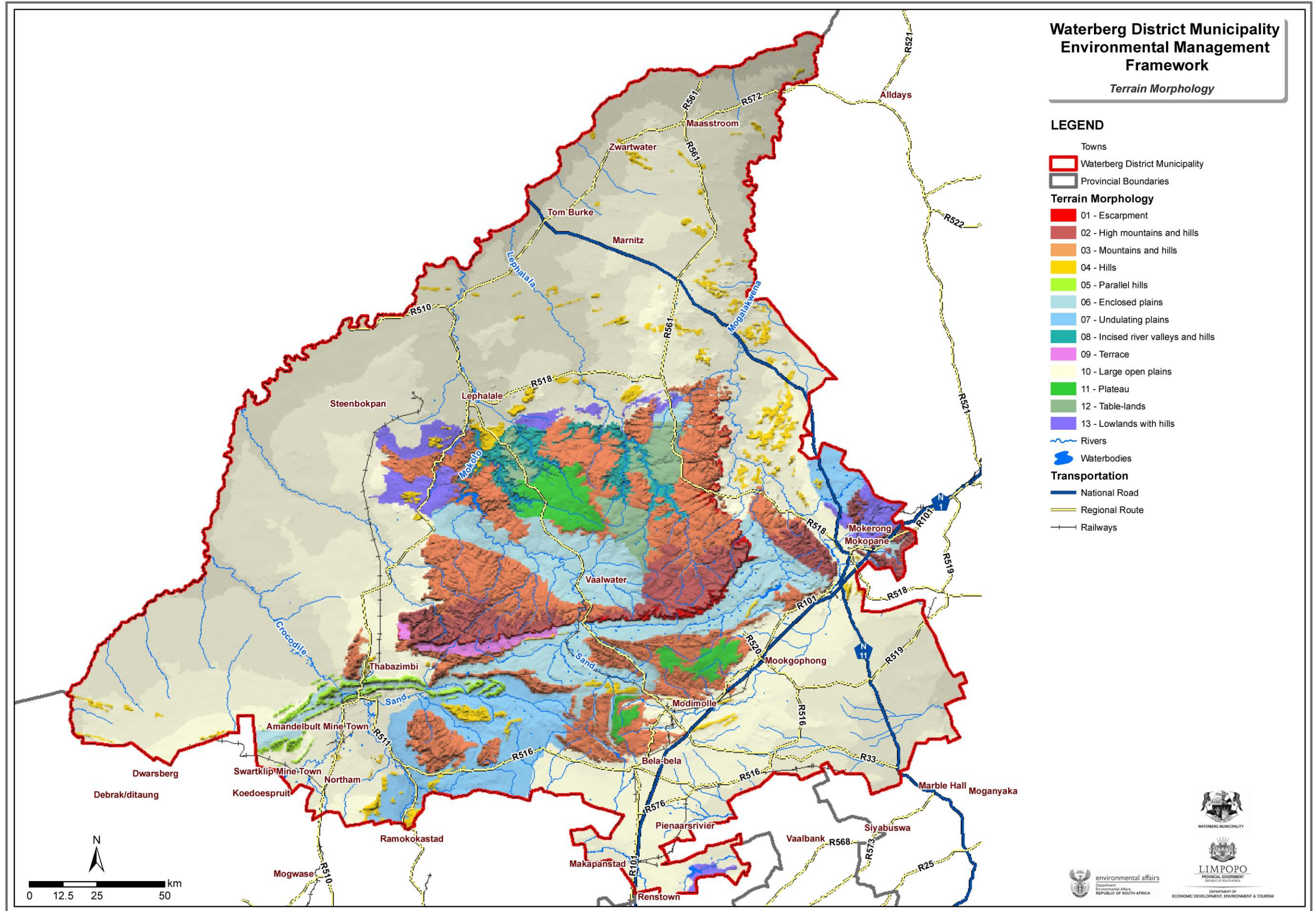
<sup>4</sup> **Peneplain** means a more or less level land surface representing an advanced stage of erosion undisturbed by crustal movements.

<sup>5</sup> **Lopolith** means a large, bowl-shaped body of igneous rock intruded between layers of sedimentary rock.

<sup>6</sup> **Periphery** means the outermost boundary of an area.

# Waterberg District Environmental Management Framework Report

Map 8: Terrain Morphology



# Waterberg District Environmental Management Framework Report

## 2.6. STEEP SLOPES

Steep slopes are inherently sensitive to change. In keeping with current developments in the EIA policies in the country steep slopes have been identified in the area. The occurrence of steep slopes in EMF area is depicted on Map 8: Steep Slopes.

## 2.7. SOIL TYPES

Many different soil types occur within the Waterberg District. Table 1: contains the broad land types for the area, as well as the area each covers in hectare and percentage. A full description of each type of land can be found in the Status Quo Report.

Broad Land Type	Area (ha)	Area (%)
Ab	26 878	0.54%
Ac	396 813	8.01%
Ad	94 988	1.92%
Ae	1 463 207	29.52%
Ag	48 52	0.10%
Ah	489 398	9.87%
Ba	84 134	1.70%
Bb	400 380	8.08%
Bc	145 708	2.94%
Bd	251 557	5.08%
Ca	58 388	1.18%
Dc	14 637	0.30%
Ea	400 041	8.07%
Fa	389 489	7.86%
Fb	68 014	1.37%
Fc	173 312	3.50%
Ia	45 035	0.91%
Ib	448 275	9.04%
Ic	78	0.00%
<b>Total</b>	<b>4 956 092</b>	<b>100%</b>

### 2.7.1. Interpreted soils data

Soils in the Waterberg District are very varied and diverse. Specific landform soil zones have already been identified in this area with their physical characteristics such as geology, soils, vegetation outlined including some indications of development potentials and limitations. Natural land type surveys conducted by the land survey staff of the Agricultural Institute for Soil, Climate, and Water (ARC – ISCW) in South Africa since the early seventies are the sources of generalized baseline soil information. Five major soil associations have therefore been identified in accordance with the existing landscape soil relations already perceived in the Waterberg District Municipality area. These are:

#### 2.7.1.1. Weakly developed soils on mountainous catchments, uplands and rocky areas

These consist of Glenrosa or Mispah soil forms or patterns derived from sandstone and quartzite. They are characterised by topsoil that overlies rock or partly weathered rock with or without lime. They are found in the central parts of the district roughly extending eastwards. They therefore tend to be rocky or

gravelly, with shallow, loamy sand soils that are acidic and therefore generally unsuitable for arable farming.

### Waterberg Escarpment



Photo: S. Taljaardt

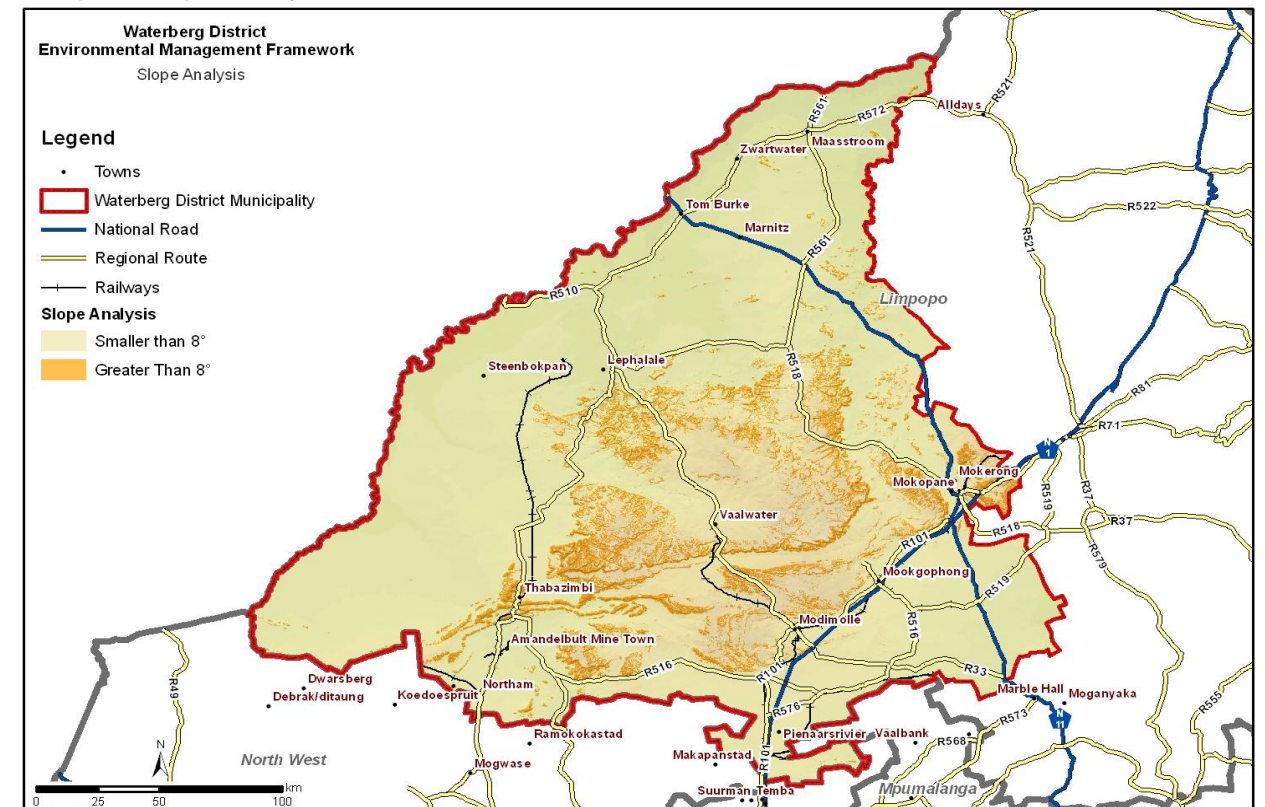
#### 2.7.1.2. Dystrophic, red and yellow, freely draining sandy soils

These soils consist of Clovelly and Hutton soil forms or patterns which are highly leached and erodible sandy and/or sandy loams derived from sandstone and quartzite. They tend to be acidic soils of low fertility found in the high rainfall areas or on mountain slopes and foothills. As such, they generally have limited value as arable land but are suitable for afforestation.

#### 2.7.1.3. Plinthic upland duplex and paraduplex soils on undulating middleveld, rugged terrain

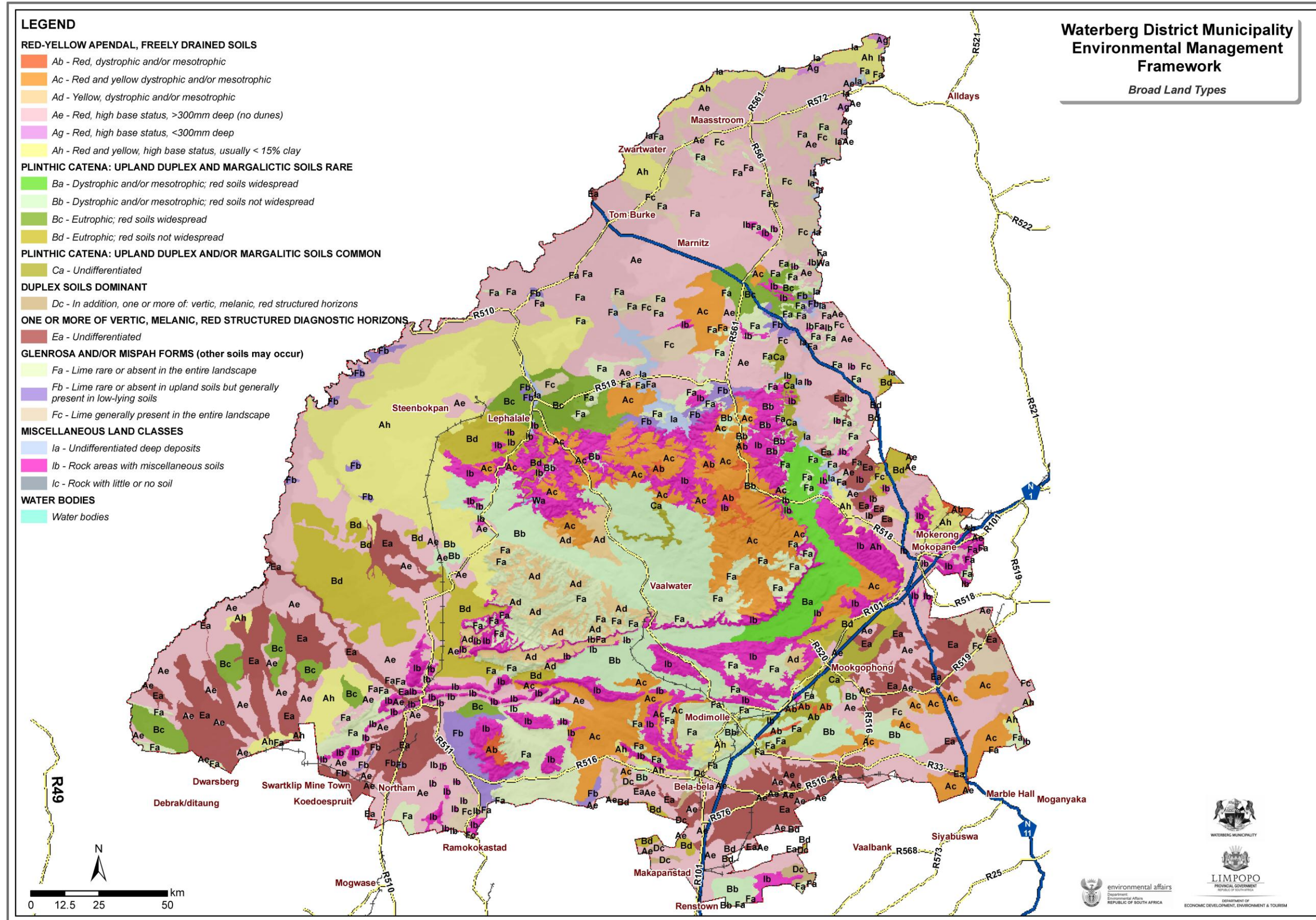
The soils are many soil forms or patterns along the catena which can be dystrophic and/or mesotrophic, sandy soils derived from sandstone quartzite and shale. They are generally characterised by topsoil that is distinct from sub-soil with regard to texture, structure and consistency. Major occurrences are roughly towards the eastern side. They are generally utilised as arable land but the risk of erosion is rather high.

**Map 9: Slope Analysis**



# Waterberg District Environmental Management Framework Report

Map 10: Broad Land Types



# Waterberg District Environmental Management Framework Report

## 2.8. AGRICULTURAL POTENTIAL

The agricultural potential of the area is intimately associated with topographical, pedological (soil) and climate determinants. As a general trend the potential for dryland cropping decreases with the rainfall distribution from south to north and west to east. Soil factors do play a role in that shallow, sandy and very high clay content soils also lead to a slight reduction in potential due to a decreased water storage / plant water supply capacity. Threats to this aspect of the land include erratic rainfall and high input costs. This is evident in the number of fields that have been cleared of bush but that are only covered in grass or encroaching bush at the moment. A component of the high input cost is land value that is skewed at present through aspects such as land restitution, increased urban and mining development and foreign land ownership. The bottom line is that with increased costs (costs of inputs, cost of land, etc.) and environmental risks (erratic rainfall, soil degradation, bush encroachment) economically viable crop production options are diminishing.

## 2.9. LAND CAPABILITY DATA FOR DRYLAND AGRICULTURE

The land capability data for the investigation area is presented on Map 10 and the total areas are provided in Table 2.

Land Capability Category	Area (ha)	Area (%)
High Total	114323	2.31%
Moderate - High Total	2055032	41.51%
Moderate Total	951309	19.22%
Low - Moderate Total	1746760	35.28%
Low Total	8302	0.17%
Permanently transformed Total	75106	1.52%
<b>Total</b>	<b>4950831</b>	<b>100.00%</b>

## 2.10. WETLANDS

The wetland data for the investigation area is presented on Map 11. It is important to note that the data was in all probability generated from aerial photographs and satellite images with some

use of topographic data. The interpretation of satellite images and aerial photographs rests on the identification of wetland vegetation. In the wetland delineation guidelines as published by DWAF (2005) four wetland indicators are specified. These are: vegetation, topography or landscape position, soil form and soil wetness. These four indicators are to be used together to provide a detailed description of wetland boundaries and functioning and it therefore follows that the wetland data provided in this report (based on vegetation and topography) cannot be used without further elucidation of soil properties on a more detailed scale.

## 2.11. SOILS AND WETLANDS

The distribution and extent of wetlands in the area is intimately linked to rainfall, geology, topography and soils. In the more mountainous areas dominated by sandstone and other hard rock geology wetland conditions are often expressed as sheets or large areas of hillslope seepage areas. It is for this reason that large parts of the Waterberg can be identified as wetland. These wetlands are often temporary and dependent on rainfall events. Due to the sandy nature of the soils wetland expression is often in

the form of bleached sandy soils covering large parts of the landscape.

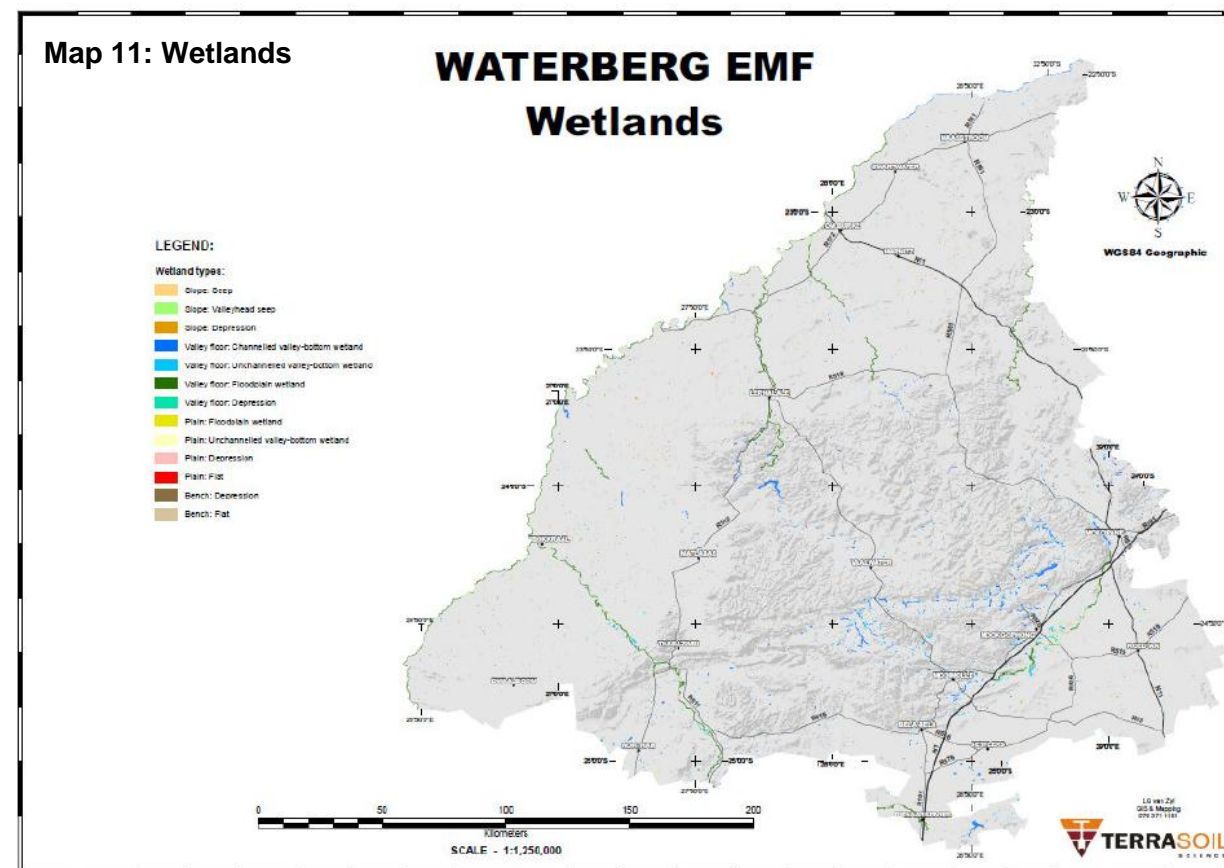
The wetlands in the areas dominated by basic igneous geology are often valley bottom wetlands with indistinct seepage areas and wetland boundaries are more abrupt. This is due to the degree of expression of wetness in these soils. A detailed description will be supplied in the detailed report.

In the flat areas to the west where rainfall also decreases. The expression of wetlands is more in the form of dry drainage features or pans and structured soil areas as compared to shallower and more rocky soils outside of the wetland zones.

## 2.12. RESOURCE RELATED CONFLICT

Due to the low rainfall the main conflicts in the area are considered to be between low intensity land uses (game farming, agronomy, conservation) and high intensity land uses (urban development and mining). The nature and outcome of the conflict has far reaching implications for low intensity land uses and tourism.

Tourism hinges on the natural and rural identity of the area. It is therefore imperative that dedicated land use planning be conducted for the district to ensure the sustainability of the different components (low intensity land uses / high intensity land uses / tourism).



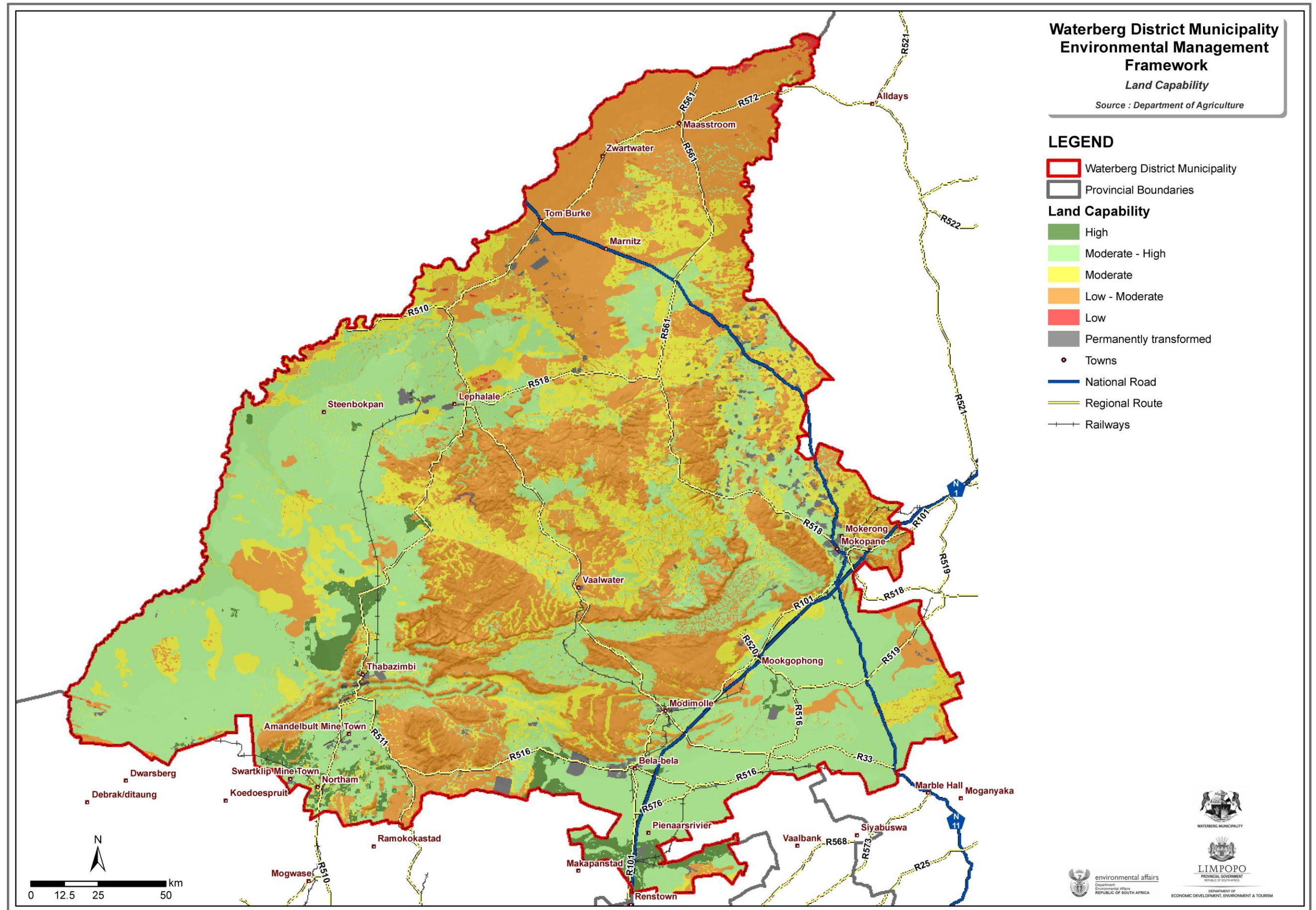
**Wetland Soil in Nylsvley**



Photo: Dr. J van der Waals

# Waterberg District Environmental Management Framework Report

Map 12: Land Capability



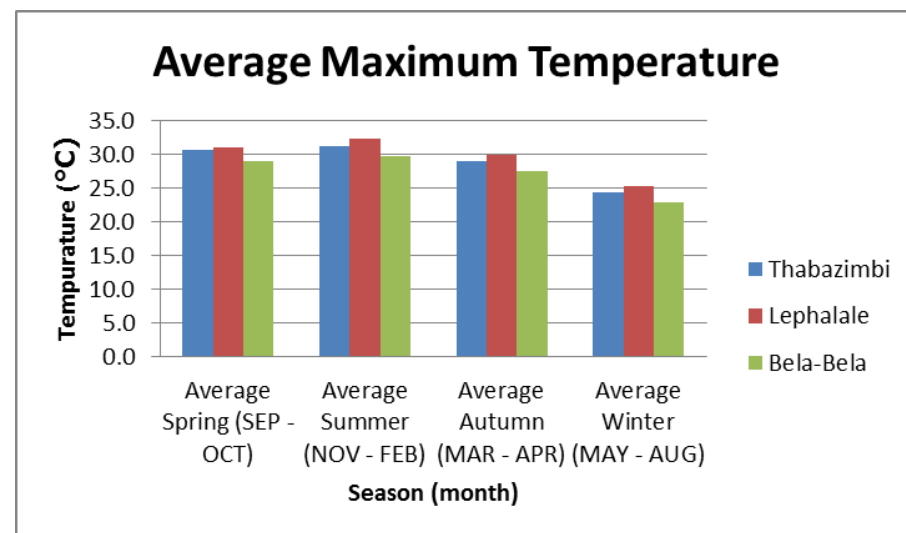
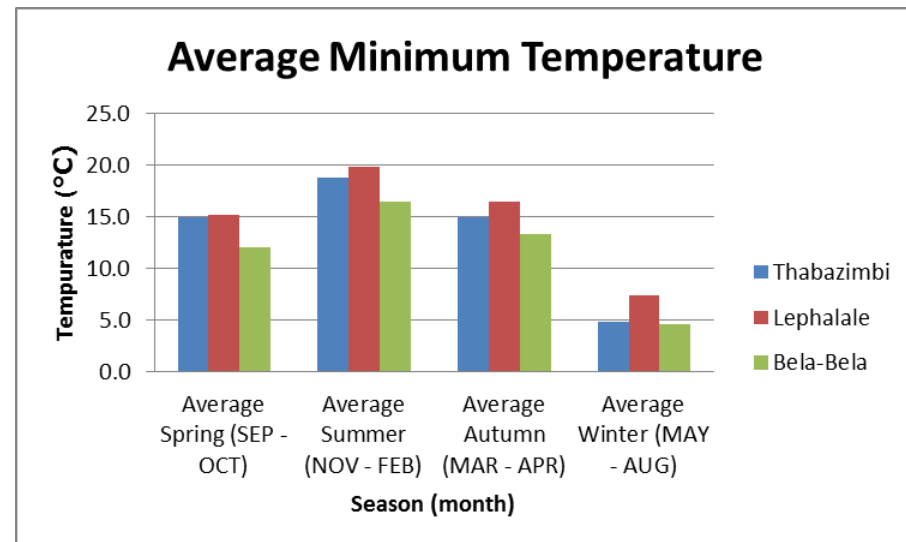
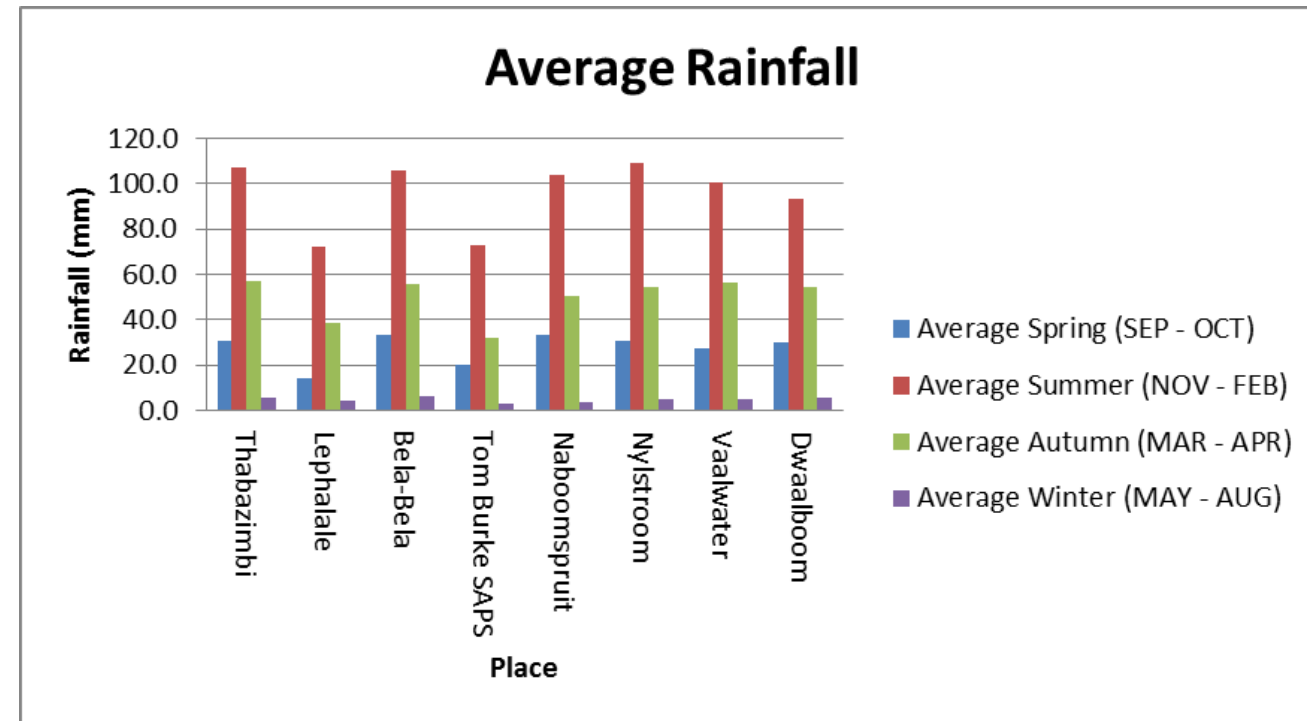
# Waterberg District Environmental Management Framework Report

## 3. CLIMATE

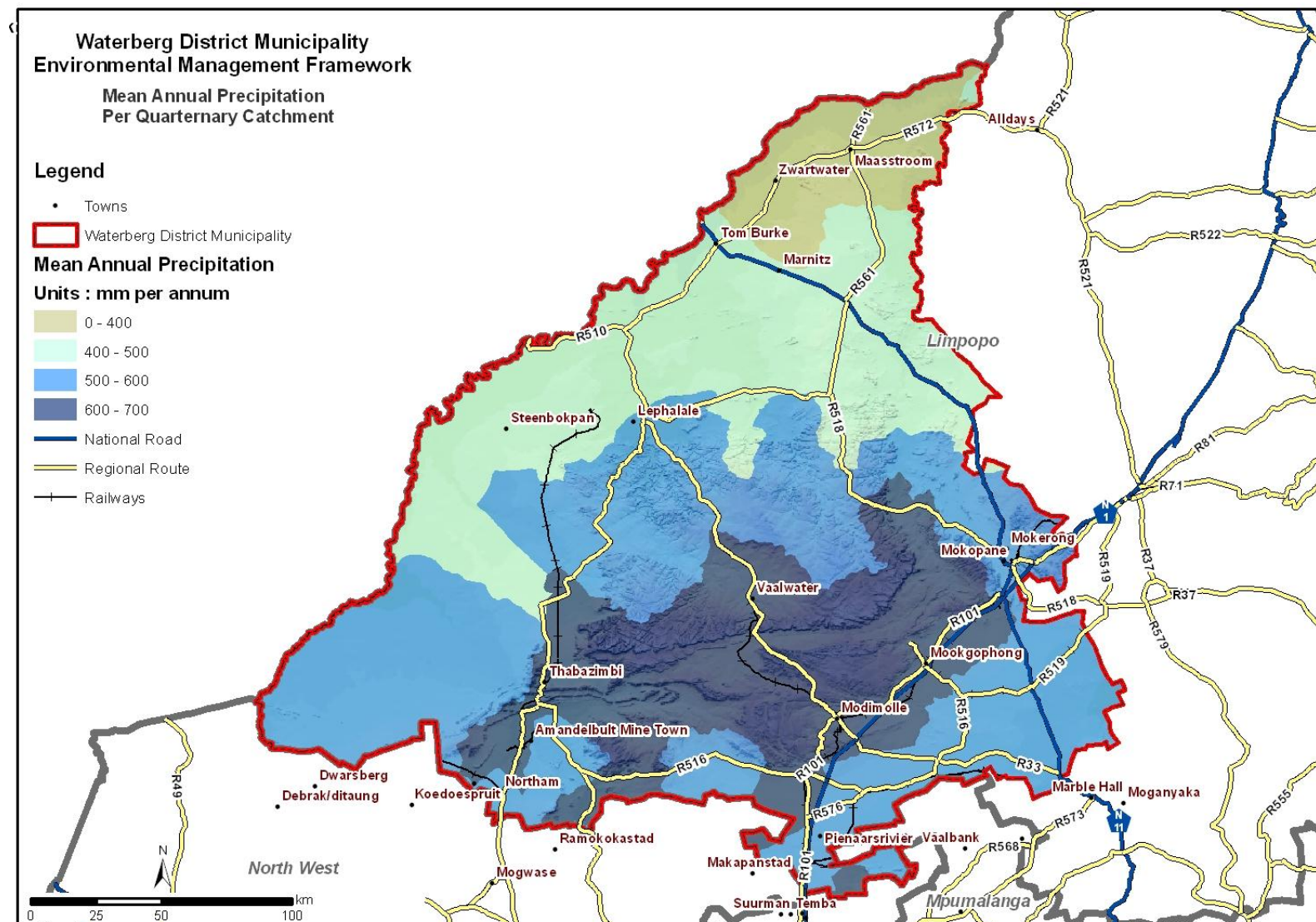
### 3.1. GENERAL DESCRIPTION

The climate of the Waterberg District varies. The northern and western regions of the area experience a hot and semi-arid climate. The southern and eastern regions are more humid and slightly cooler. The Waterberg District receives summer rainfall. The area south-east of the Waterberg formation as well as the Waterberg formation itself receive more rainfall than the surrounding area. Thabazimbi receives the lowest rainfall of the recorded weather stations in the EMF area. Summer temperatures for the area are generally very warm, while winter temperatures are mild to cool.

The data used has been obtained from the South African Weather Bureau. The charts are a summary of the weather data obtained. For the full data please consult the Status Quo Report.



Map 13: Mean Annual Precipitation per Quaternary Catchment



# Waterberg District Environmental Management Framework Report

## 3.2. ATMOSPHERIC CONDITIONS

Comprehensive information on the atmospheric conditions found in the Waterberg District area can be found in the Waterberg District Municipality Air Quality Management Plan completed in June 2009.

### 3.2.1. Macroscale air circulation

The mean circulation of the atmosphere over southern Africa is anticyclonic throughout the year. Anticyclones centered over the subcontinent are associated with subsidence of air which produces clear, dry, stable conditions.

### 3.2.2. Mesoscale air circulation

Mesoscale circulations have implications for the transport and recirculation of pollutants in an airshed. Mesoscale circulations include air transport near the surface. This air transport can be induced by differences in temperature, pressure and density in air layers or by topographically induced local winds such as those on slopes and in valleys.

### 3.2.3. Wind

Wind roses summarize the occurrence of winds at a location, representing their strength, direction and frequency. Calm conditions are defined as wind speeds less than  $1 \text{ m.s}^{-1}$ . Each directional branch on a wind rose represents wind originating from that direction. Each directional branch is divided into segments of different colours which are representative of different wind speeds. Wind speed classes are represented as  $1 - 2 \text{ m.s}^{-1}$  (slow),  $2 - 4 \text{ m.s}^{-1}$  (moderate),  $4 - 6 \text{ m.s}^{-1}$  (strong) and  $> 6 \text{ m.s}^{-1}$  (fast).

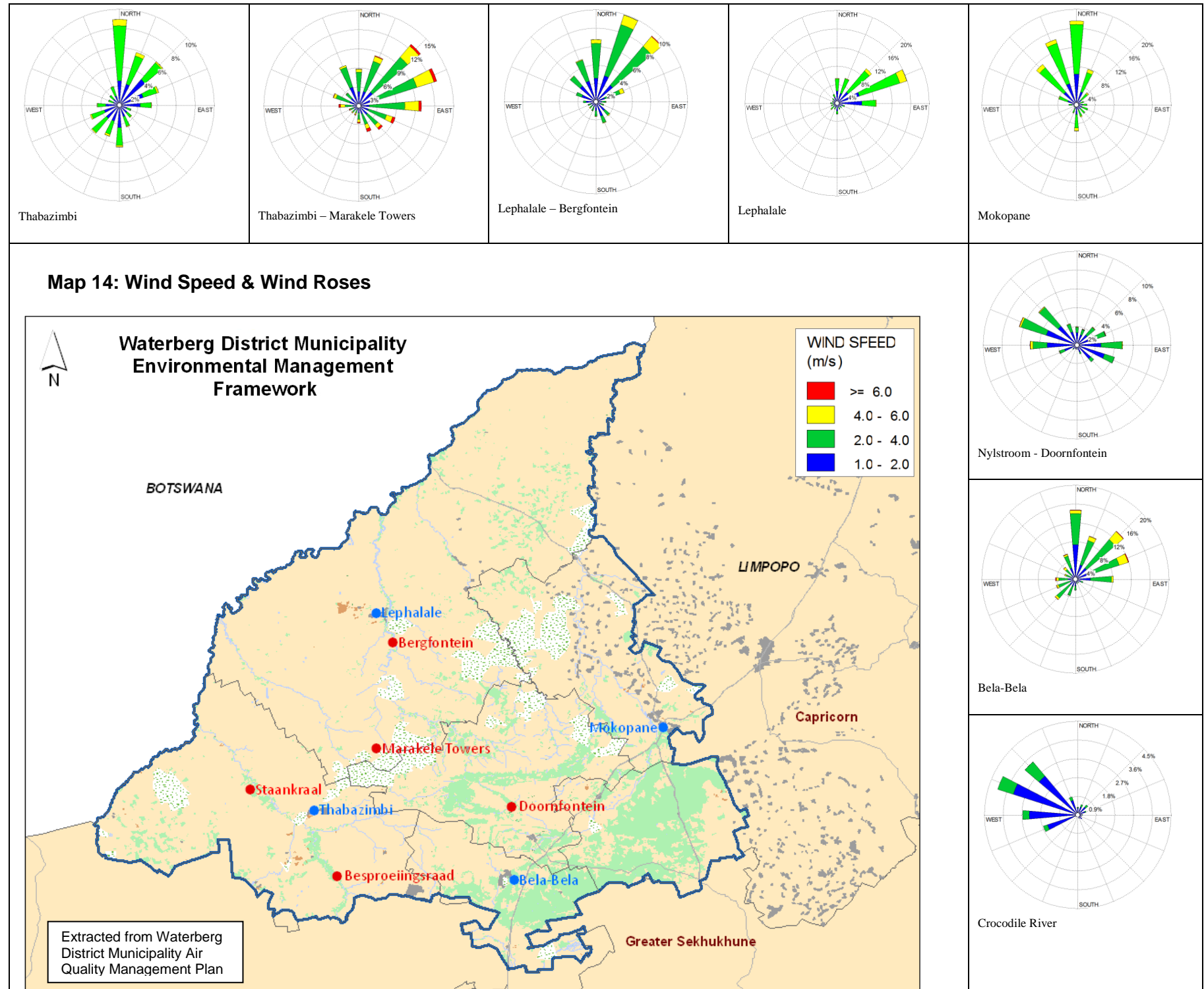
The topography of the Waterberg District has a strong influence on the wind field. More details on the wind fields and the atmospheric conditions can be viewed in the Status Quo Report or the Air Quality Management Plan.

## 3.3. CONCLUSION

No measurable evidence of global warming can be discerned from the available information due to the natural fluctuations that occur. Information for a much longer period, which is currently not available, will be necessary to draw firm conclusions in this regard.

The meteorological conditions will also have an effect on the ambient air quality of the area. These conditions need to be taken

into account when considering the effects of air pollution in the various regions.



## 4. HYDROLOGY

There are two Water Management Areas that fall within the EMF area, Limpopo WMA and the Crocodile (West) and Marico WMA. The Limpopo Water Management Area (WMA) is the northern most water management area in the country and represents part of the South African portion of the Limpopo Basin, which is also shared by Botswana, Zimbabwe and Mozambique. The Limpopo WMA consists of a number of catchments, which are mostly independent of each other. The Crocodile West Marico WMA is situated to the west and forms the Boundary with Botswana. Only the north or northeast corners lie within the EMF area.

There are two main rivers of importance, the Lower Crocodile River and the Mokolo River. The Mokolo River, also sometimes called the Mogol River or the Mogolo River is one of the main rivers in the EMF area. The river and its tributaries rise in the western part of the Waterberg between 1200 and 1600 metres above mean sea level. It originates in a flattish, open area with numerous koppies. After flowing through a steep gorge the river emerges above the town of Vaalwater. From here it flows through a relatively flat area until it enters the Mokolo Dam. From the dam, it flows through another gorge before entering the Limpopo Plain, near the junction with the Rietspruit. The Mokolo River proceeds to flow through flat sandy areas until it reaches the Limpopo River.

The Lower Crocodile River, downstream of the confluence of the Elands River falls within the study area. The river has two large tributaries, namely the Sand River and the Bierspruit, which join the Crocodile River west of the town of Thabazimbi. The Lower Crocodile River flows in a north/north-westerly direction until the confluence with the Marico River. After the confluence the river is known as the Limpopo River.

### 4.1. CATCHMENTS

The Waterberg District has five catchments that fall within its boundaries. Most of the rivers drain in a north-westerly direction to the Limpopo River.

#### 4.1.1. Lower Crocodile River Sub-catchment

The Lower Crocodile River sub-catchment generates around 100 cubic m/annum of runoff. The Vaalkop, Roodekopjes, (Hartebeespoort), Klipvoor and Bierspruit Dams are water sources, which directly feed the Lower Crocodile River area. A mine near Northam receives its water from a Rand Water pipeline running from the Vaal Dam. The entire catchment areas of the Matlabas River is situated in the Waterberg District Municipality and has an estimated MAR of 37 million cubic metres, of which only 9 million cubic metres can be considered available on a 70% assurance base. This river has an inconsistent runoff.

#### 4.1.2. Mokolo (or Mogol) River Catchment

The upper reaches of this catchment receives a fair amount of water from the Waterberg mountain range. The Mokolo River and its tributaries form a considerable river system that drains 8 450 km<sup>2</sup> with an estimated MAR of 272 million cubic metres of which 98 million cubic metres can be utilised economically. Halfway down the catchment the Mokolo Dam (formerly known as the Hans Strydom Dam) can be found. It supplies water to Matimba Power Station, the Grootegeluk Coal Mine and the greater Lephalale area. Downstream of the dam, farmers make use of the irrigation allocation.

#### 4.1.3. Lephalala River Catchment

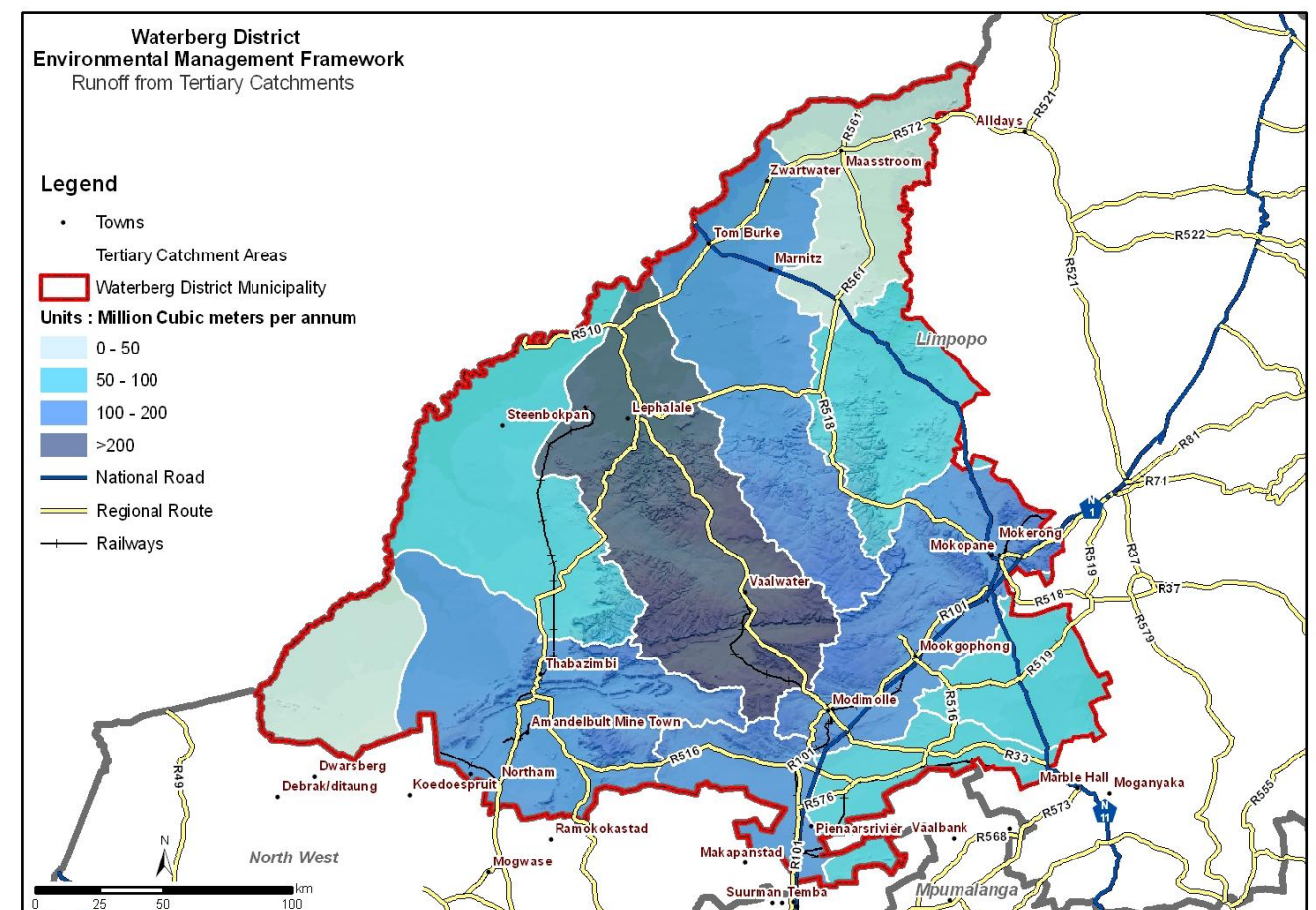
The drainage area of the Lephalala River Catchment is around 4866 km<sup>2</sup> with a MAR of about 135 million cubic m/annum. There is no major dam in this catchment area and irrigation is limited.

#### 4.1.4. Mogalakwena River Catchment

The Mogalakwena River Catchment covers an area of 19 327 km<sup>2</sup> and the MAR is around 140 million cubic m/annum. Two major dams, the Glen Alpine Dam and the Doringdraai Dam are located in this catchment. The Doringdraai Dam supplies water to Mokopane (Potgietersrus), whilst the Glen Alpine Dam provides the immediate and downstream area with water for both primary use and irrigation. Modimolle (Nylstroom) also receives its water from small local dams such as the Donkerpoort Dam and the Welgevonden Dam as well as via a pipeline from the Roodeplaat Dam, near Pretoria.

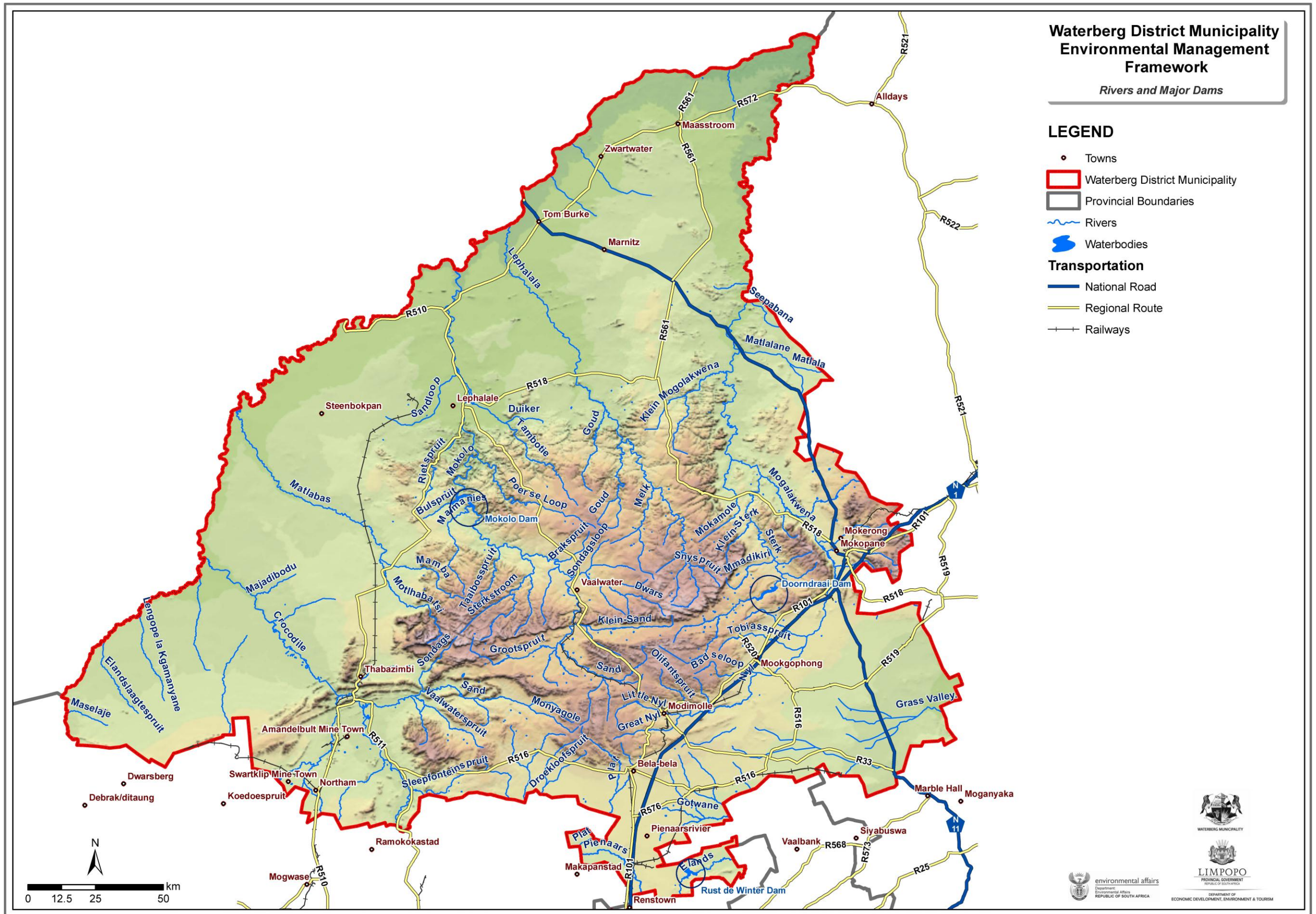
Nylsvley is a major feature in the southern Nyl catchment between Modimolle and Mokopane.

Map 15: Runoff from Tertiary Catchments



# Waterberg District Environmental Management Framework Report

Map 16: Rivers and Major Dams



# Waterberg District Environmental Management Framework Report

## 4.2. MAJOR DAMS

There are only three large dams in the Waterberg District. Many smaller dams do exist, but these are mostly for irrigation purposes.

### 4.2.1. The Mokolo Dam

The Mokolo Dam is the largest in the EMF area. The dam was constructed in the late 1970's primarily to supply water to the Matimba power station but the dam also supplies water to the town of Lephalale. The dam also supplies water for irrigation purposes downstream. After the construction of the Mokolo Dam, rapid and extensive irrigation development took place upstream. This resulted in a large reduction of the dam's yield from an estimated 39 million m<sup>3</sup>/a (RSA, 1970) to 23 million m<sup>3</sup>/a (DWAF, 1992). This figure has since been updated by DWA to 29 million m<sup>3</sup>/a. The dam's water is currently fully allocated.

The allocations for the Mokolo Dam are as follows (DWAF, 2001b):

- Matimba power station: 7,3 million m<sup>3</sup>/a;
- Iscor coal mine: 9,9 million m<sup>3</sup>/a;
- Lephalale: 1,0 million m<sup>3</sup>/a; and
- irrigation (downstream of dam) 10,4 million m<sup>3</sup>/a

Total 28,6 million m<sup>3</sup>/a.

### 4.2.2. The Doorndraai Dam

Doorndraai Dam is situated on the Sterk River near Mokopane and supplies water to Mokopane as well as to irrigators along the Sterk River. Construction of the dam was completed in 1953 and it was raised in 1975. The yield of the raised Doorndraai Dam is estimated at 8,6 million m<sup>3</sup>/a (DWAF, 2001b).

The allocations for the Doorndraai Dam are as follows (DWAF, 2001b):

- Mokopane: 4,4 million m<sup>3</sup>/a; and
- Irrigation (downstream of dam) 3,7 million m<sup>3</sup>/a

Total 8,1 million m<sup>3</sup>/a

### 4.2.3. The Glen Alpine Dam

The Glen Alpine Dam is situated on the Mogalakwena River. The yield of this dam is limited due to its small size, the ephemeral nature of the runoff into the dam, and the high evaporation rates in this area. The dam was completed in 1967 and supplies water to irrigators downstream. The allocation to irrigators was 5,9 million m<sup>3</sup>/a, but of this 1,6 million m<sup>3</sup>/a was to irrigators in Lebowa who never took up this allocation. However, 6,9 million m<sup>3</sup>/a has been registered by water users as water use sourced from the Glen Alpine Dam, so it will be necessary to verify the lawfulness of these registered water users before reallocating Lebowa's allocation to other users.

### 4.2.4. Other dams

There are many other smaller dams found within the study area. Their main use appears to be for irrigation. These dams do however have impact on the water systems by reducing the overall water yield of various rivers.

## 4.3. RIVER HEALTH<sup>7</sup>

### 4.3.1. General Introduction

The information was taken from the State of the Rivers Reports for the Crocodile West Marico Water Management Area, the Mokolo River Catchment and the Phalala (Lephalala) River Catchment. These State of the Rivers Reports were completed in 2005 and 2006. They are the most recent available information on these river systems. For the full descriptions please review the Status Quo Report or the State of the Rivers Reports. For a summary of the status of the rivers please refer to Table 3.

<sup>7</sup> River Health Programme (2007) *A Biomonitoring Survey of the Lephalala River Catchment Limpopo Province Field Survey of 2005*. M.K. Angliss. Specialist Scientist. Limpopo Environmental Affairs.  
 River Health Programme (2005). *State-of-Rivers Report: Monitoring and Managing the Ecological State of Rivers in the Crocodile (West) Marico Water Management Area*. Department of Environmental Affairs and Tourism. Pretoria. ISBN NO: 0-620-34054-1  
 River Health Programme (2006) *State-of-Rivers Report The Mokolo River System*. Department of Environmental Affairs and Tourism. Pretoria. ISBN No. 978-0-620-38215-1.

	Fish Assemblage Integrity Index (FAII)	Riparian Vegetation Index (RVI)	South African Scoring System (SASS) / Macro Invertebrate Response Assessment Index (MIRAI)	Overall Ecological Status	Ecological Importance and Sensitivity (EIS)
Lower Crocodile River	Poor	Poor	Poor	Poor	Moderate
Sundays River	Fair	Poor	Poor	Fair	Moderate
Lower Marico	Poor	Good	No Data	Fair	Moderate
The Sand Tributaries	Fair	Fair	Fair	Fair	Moderate
The Sterkstroom Catchment	Fair	Fair	Fair	Fair	High
The Rietspruit Catchment	Fair	Good	Fair	Fair	Moderate
The Upper Mokolo River	Good	Fair	Good	Fair	Moderate
Dwars River & Jimse-loop River	Fair	Fair	Good	Fair	Moderate
The Middle Mokolo River Upstream of the Mokolo Dam	Good	Fair	Good	Good	Moderate
The Middle Mokolo River Downstream of the Mokolo Dam	Fair	Fair	Fair	Fair	Moderate
The Lower Mokolo Region: The Limpopo Plain	Fair	Fair	Fair	Fair	Moderate
Lephalala upper tributaries	Fair	No Data	Good	Fair	High
Lephalala Waterberg	Fair	No Data	Good	Fair	High
Lephalala	Fair	No Data	Good	Fair	Moderate
Blocklandspruit	Fair	No Data	Good	Fair	High
Daggakraal	Fair	No Data	Good	Fair	Low / Marginal

### Lephalale River



Photo: S. Taljaardt

# Waterberg District Environmental Management Framework Report

## 4.4. GROUNDWATER

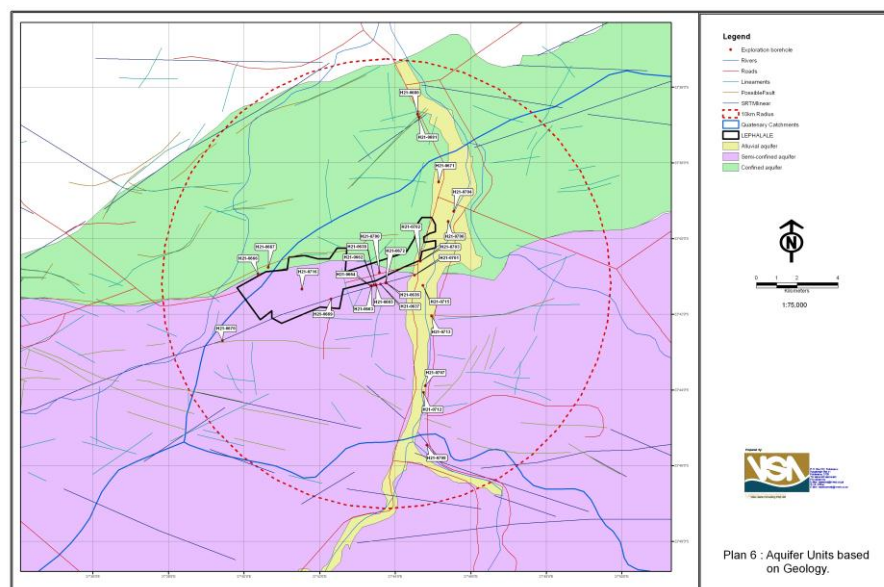
The Waterberg District has limited useable groundwater resources. Areas indicated on the map as having 2.0 - 5.0 median l / sec and above are areas that groundwater can be utilised as a viable water source.

The largest areas of usable groundwater are found to the south-east of the Waterberg Mountains.

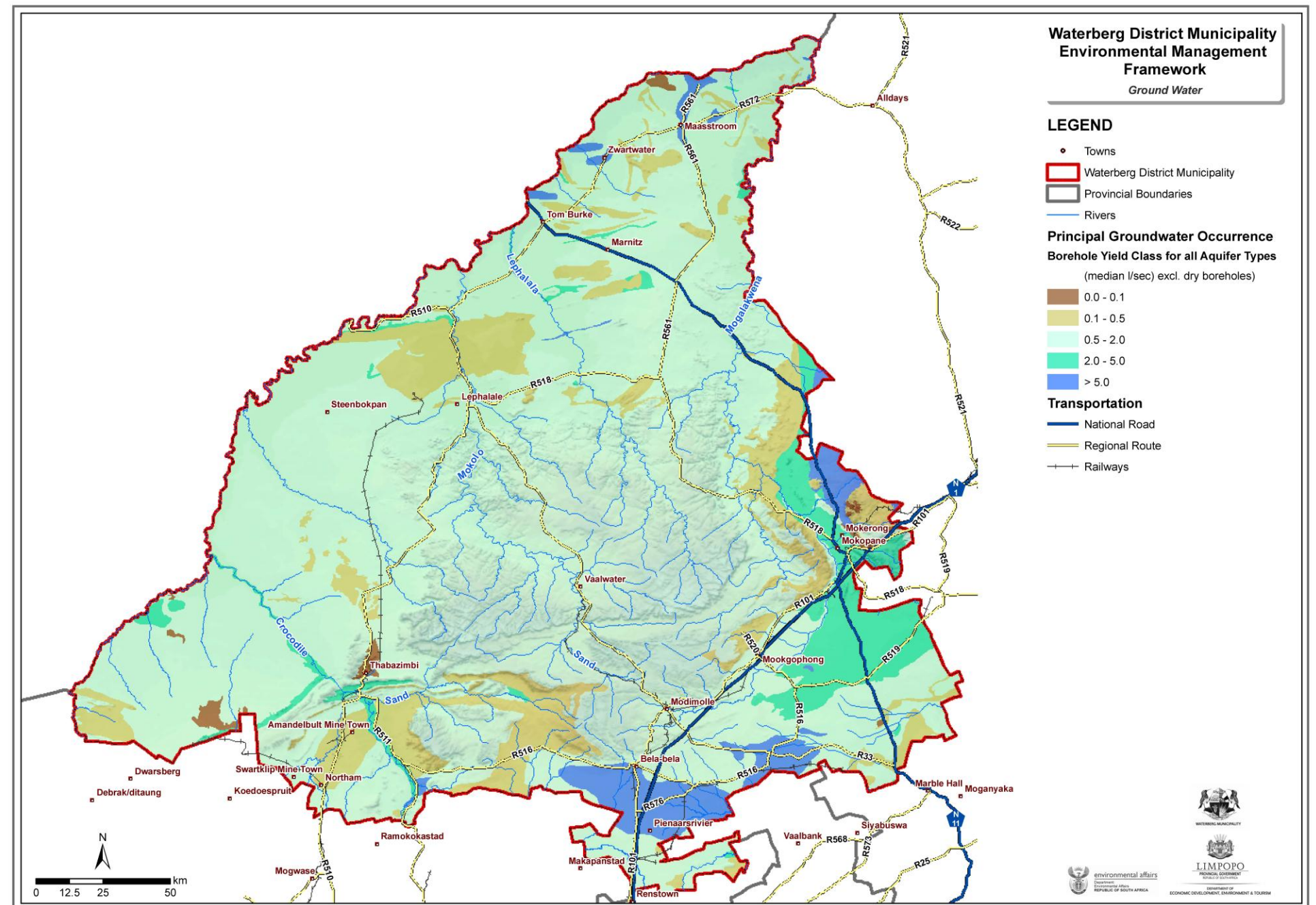
A groundwater study of the Lephalale area confirmed the existence of three types of aquifers which could in future be used to augment the water supply in that area. Some of these are very deep in the Waterberg geological structures underneath the Ecca structures that overlay them in the area, while others occur in the shallow alluvium deposits. The extent to which that will be possible will depend on the manner in which the water is used and the demands that are placed on it. A number of scenarios were investigated, some being more sustainable than others. This work must be kept in mind when the use of groundwater in the area is considered.

There are also possibilities to recharge the aquifers in the area. The viability and cost would however need further investigation.

Map 17: Aquifer Units based on Geology



Map 18: Ground Water



For further information please consult: “Hydrogeological Assessment and Aquifer Recharge Potential within the Lephalale (Ellisras) Local Municipality Area Phase 3: Artificial Recharge and Geochemistry Report Nr: PWMA 01/A42/00/02209\_02”, Prepared by VSALEBOA CONSULTING For the Directorate: Water Resource Planning Systems (WRPS) , 10 June 2010.

# Waterberg District Environmental Management Framework Report

## 5. BIOLOGY

### 5.1. VEGETATION

The Biomes of South Africa have been divided up into bioregions, which are the intermediate level of vegetation organisation between that of vegetation type and biome. Bioregions are defined on the basis of similar biotic and physical features and processes at regional scale. Most of the study area is within the Central Bushveld Bioregion, which falls within the Savanna Biome. There are also small patches of vegetation that fall within the Mesic Highveld Grassland Bioregion, which falls within the Grassland Biome. These bioregions and Biomes are zonal vegetation types, which is vegetation typical of particular climatic zones. Azonal vegetation, in contrast, occurs under special substrate and/or hydrogeological conditions, which exert an over-riding influence on floristic composition, structure and dynamics over macroclimate. There are various azonal vegetation types occurring in the study area, including azonal forest, alluvial vegetation and inland saline vegetation.

The description of the vegetation types as well as species lists can be found in the Status Quo Report. Table 5 contains a list of the vegetation types, the biome they occur in as well as conservation data and status.

### 5.2. CONSERVATION FEATURES

#### 5.2.1. Flora

There are five vegetation types in the study area for which there is serious conservation concern (Table 5), namely Lowveld Riverine Forest, Springbokvlakte Thornveld, Central Sandy Bushveld, Makhado Sweet Bushveld and Subtropical Salt Pans. Of these, two are listed in the Draft National List of Threatened Ecosystems (GN 1477 of 2009, published under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)), where Lowveld Riverine Forest and Springbokvlakte Thornveld are both listed as Vulnerable. This implies that these two vegetation types (Lowveld Riverine Forest and Springbokvlakte Thornveld) are

accorded protection under Act No. 10 of 2004. Wetlands are protected under the National Water Act (1998), which covers the vegetation types, Subtropical Freshwater Wetlands, Subtropical Salt Pans and Subtropical Alluvial Vegetation.

The distribution of vegetation types in different conservation categories is shown in Map 19. The small patches of the Critically Endangered Lowveld Riverine Forest is situated in the north near the boarder, between Tom Burke and Zwartwater.

Lists of plant species previously recorded in the quarter degree grids in which the study area is situated were obtained from the South African National Biodiversity Institute. Additional species that could occur in similar habitats, as determined from database searches and literature sources, but have not been recorded in these grids are also listed.

Of the species that are considered to occur within the geographical area under consideration, there were 64 species recorded in the quarter degree grids that constitute the study area. According to IUCN Ver. 3.1 (IUCN, 2001) three of these are listed as Critically Endangered, three as Endangered, 15 as Vulnerable, 12 as Near Threatened, one as Critically Rare, 14 as Declining and 16 as Rare (see Table 4 for explanation of categories).

IUCN / Orange List category	Definition	Class
EX	Extinct	Extinct
CR	Critically Endangered	Red List
EN	Endangered	Red List
VU	Vulnerable	Red List
NT	Near Threatened	Orange List
LC (Declining)	Least Concern, declining taxa	Orange List
LC (Rare)	Least Concern, rare	Orange List
LC (Critically Rare)	Least Concern, rare: only one subpopulation	Orange List
LC (Rare-Sparse)	Least Concern, rare: widely distributed but rare	Orange List

An indication of the distribution of Red and Orange List plant species is given in Figure 1. This shows grids in which these species are found with Critically Endangered and Endangered species grids shown in red, Vulnerable species grids shown in Orange and remaining species grids shown in yellow. The most

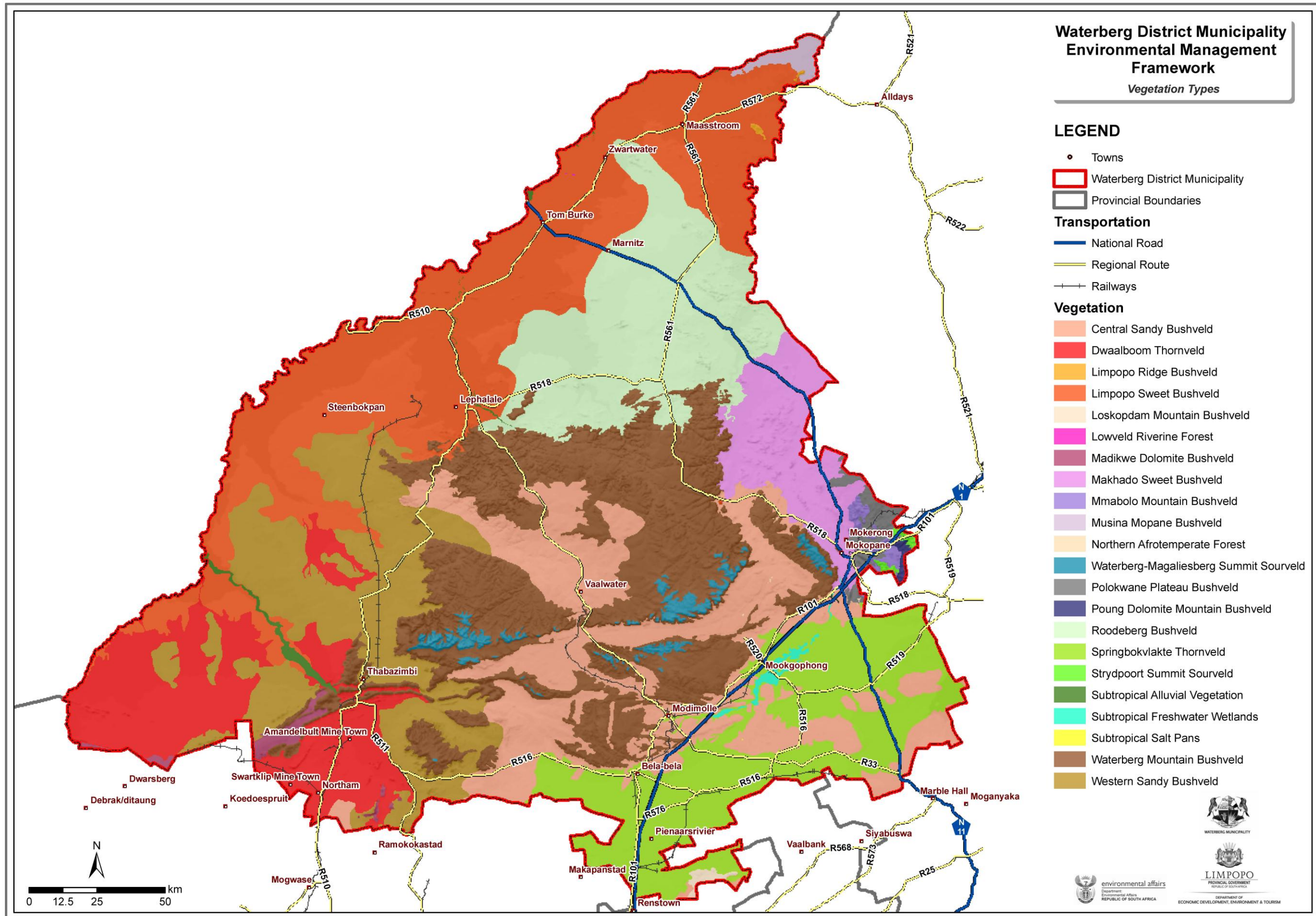
important areas in terms of containing the most threatened species are as follows (in order of importance):

1. Potgietersrus 2429AA (Buffelshoekberge): 4 Red and 13 Orange List species
2. Kransberg 2427BC (SW part of Waterberg): 4 Red and 4 Orange List species
3. Naboomspruit 2428DA (SE of Waterberg): 3 Red and 7 Orange List species
4. Lekkerrus 2428BC (central part of Waterberg): 3 Red and 2 Orange List species
5. Haakdoring 2428BD (SE part of Waterberg): 2 Red and 4 Orange List species
6. Crecy 2428DB (SE of Waterberg): 2 Red and 3 Orange List species
7. Warmbad 2428CD (S of Waterberg): 1 Red and 8 Orange List species
8. Pienaarsrivier 2528AB (near Gauteng): 1 Red and 5 Orange List species
9. Sterkrivier 2428BA (central part of Waterberg): 1 Red and 4 Orange List species
10. Nylstroom 2428 CB (S part of Waterberg): 1 Red and 4 Orange List species
11. Heiningsfontein 2428AD (central part of Waterberg): 1 Red and 2 Orange List species
12. Settlers 2428DC (S of Waterberg): 1 Red and 1 Orange List species
13. Sentrum 2427AD (just north of Thabazimbi): 1 Red List species

A list of protected trees found within the Waterberg District can be viewed in the Status Quo Document.

# Waterberg District Environmental Management Framework Report

Map 19: Vegetation Types



# Waterberg District Environmental Management Framework Report

## 5.2.2. Fauna

All Red List vertebrates (mammals, birds, reptiles, amphibians) that could occur in the study area are listed in the Status Quo Report. Those vertebrate species with a geographical distribution that includes the study area are discussed further.

There are 43 mammal species of conservation concern that occur in the study area. Thirteen of these species are threatened with extinction and are on the Red List (classified as CR, EN or VU). Seven of these species are only found in protected areas, game reserves or in private breeding programmes. These are the Tsessebe, Black Rhino, Roan Antelope, Sable Antelope, Cheetah, African Wild Dog and Lion. There are six mammal species on the Red List that have a restricted distribution in the study area and which survive independently of conservation efforts, i.e. are dependent on maintenance of natural habitat outside of protected areas. These are the Short-eared Trident Bat, Botswana Long-eared Bat, Peak-saddle Horseshoe Bat, Juliana's Golden Mole, the Giant Rat and the Pangolin. The grids where these species have been previously recorded is shown in Figure 2.

There are 21 threatened bird species (CR, EN or VU) that are found in the study area. They are found in a variety of habitats, although some patterns are evident. Large rivers, streams and wetlands provide important habitat for a number of species. Cliffs and mountainous areas are important for many species, including a number of vulture species. Woodlands and savanna vegetation provide foraging habitat for many of the species found in the area.

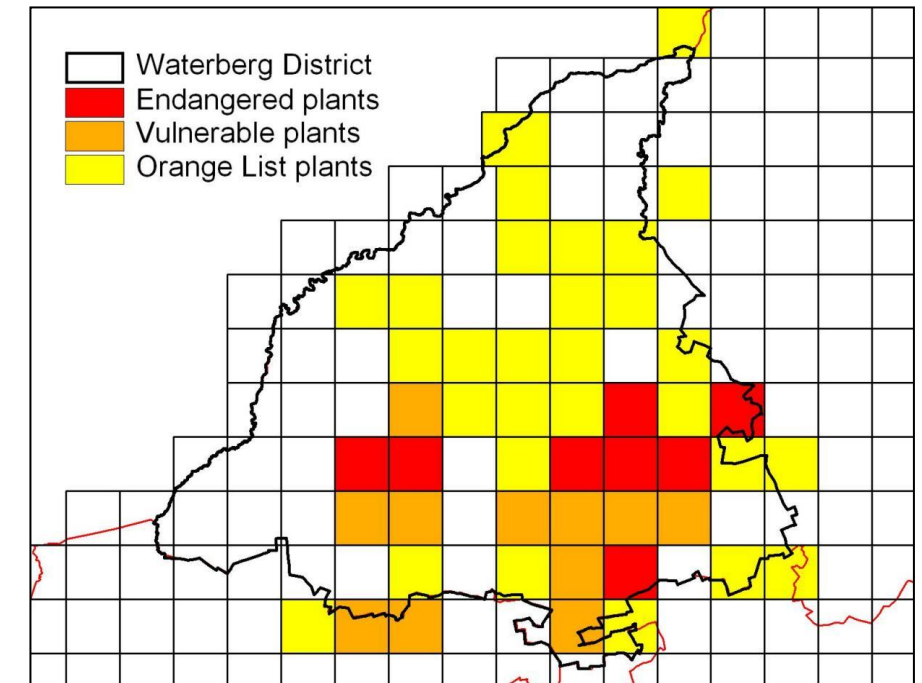
There is one frog species of conservation concern, the Giant Bullfrog, previously recorded in the grids in which the study area is located and which could occur there.

There are two Vulnerable and one Near-threatened reptile species that have a distribution that includes the study area. The Near Threatened species occurs only peripherally in the study area. The other two species are the Nile crocodile and the African Rock Python.

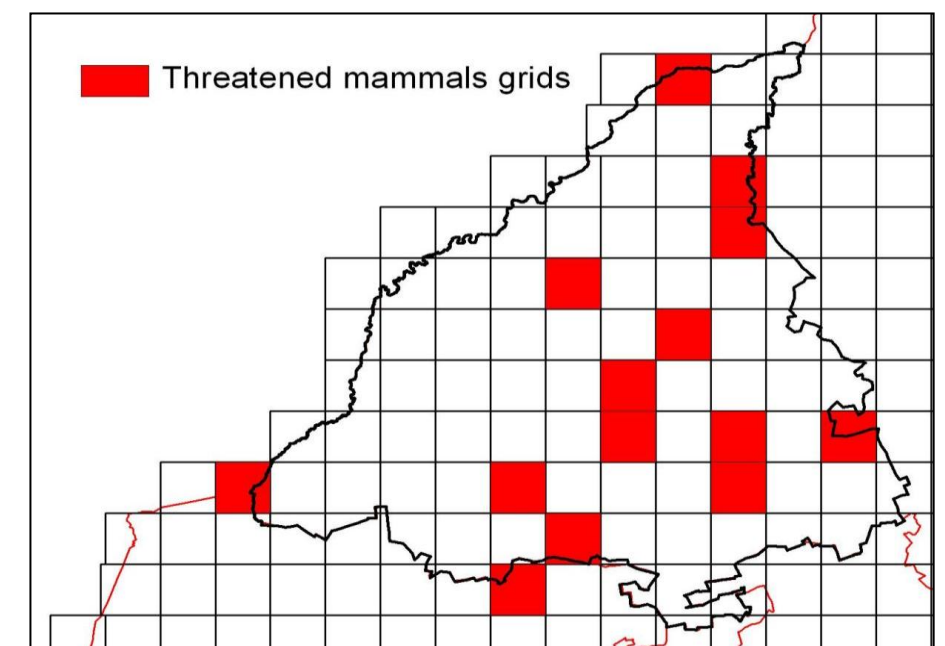
**Table 5: Conservation status of different vegetation types occurring in the EMF study area, according to Driver et al. 2005 and Mucina et al. 2006**

Vegetation type	Biome	Cons. target	Protected	Remain	Conservation status
Dwaalboom Thornveld	Savanna	19%	6%	86%	Least Threatened
Madikwe Dolomite Bushveld	Savanna	19%	18%	99%	Least Threatened
Central Sandy Bushveld	Savanna	19%	3%	76%	Vulnerable
Loskop Mountain Bushveld	Savanna	24%	14%	98%	Least Threatened
Springbokvlakte Thornveld	Savanna	19%	1%	51%	Endangered
Western Sandy Bushveld	Savanna	19%	6%	96%	Least Threatened
Waterberg Mountain Bushveld	Savanna	24%	9%	97%	Least Threatened
Roodeberg Bushveld	Savanna	19%	6%	82%	Least Threatened
Limpopo Sweet Bushveld	Savanna	19%	1%	95%	Least Threatened
Makhado Sweet Bushveld	Savanna	19%	1%	73%	Vulnerable
Mamabolo Mountain Bushveld	Savanna	24%	8%	24%	Least Threatened
Polokwane Plateau Bushveld	Savanna	19%	1%	83%	Least Threatened
Poung Dolomite Mountain Bushveld	Savanna	24%	10%	94%	Least Threatened
Musina Mopane Bushveld	Savanna	19%	2%	97%	Least Threatened
Strydpoort Summit Sourveld	Grassland	24%	17%	99%	Least Threatened
Waterberg-Magaliesberg Summit Sourveld	Grassland	24%	26%	100%	Least Threatened
Northern Afrotropical Forest	Forest	31%	37%	99%	Least Threatened
Lowveld Riverine Forest	Forest	100%	100%	97%	Critically Endangered
Subtropical Freshwater Wetlands	Wetlands	24%	40%	94%	Least Threatened
Subtropical Salt Pans	Wetlands	24%	20%	69%	Vulnerable
Subtropical Alluvial Vegetation	Wetlands	31%	71%	84%	Least Threatened

**Figure 1: Distribution of Red and Orange List plant species in the study area**

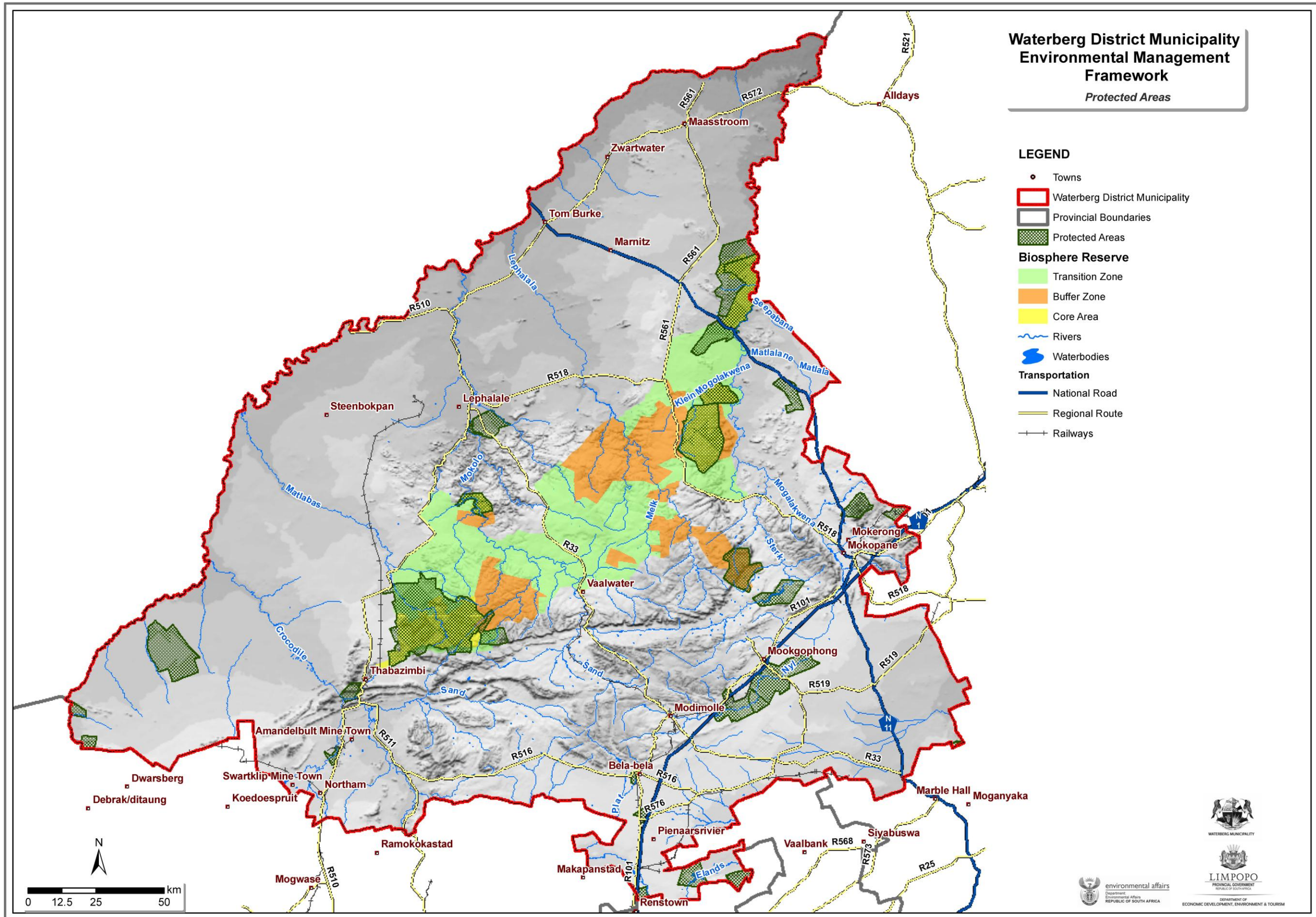


**Figure 2: Distribution of Red List mammal species in the study area**



# Waterberg District Environmental Management Framework Report

Map 20: Protected Areas



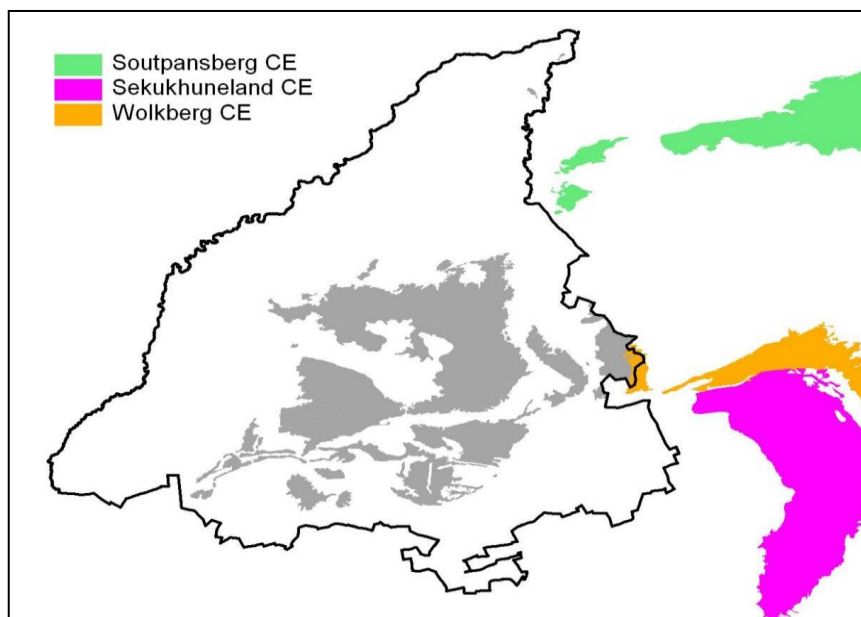
## 5.3. OTHER FEATURES OF CONSERVATION IMPORTANCE

### 5.3.1. Centres of endemism

South Africa contains a number of areas where there are high levels of endemism amongst plant species. This means that high proportions of the species are restricted to that area and occur nowhere else.

There are three Centres of Endemism that occur near to the eastern boundary of the study area, the Soutpansberg Centre, the Sekukhuneland Centre and the Wolkberg Centre (van Wyk & Smith 2001). A small piece of the Wolkberg Centre of Endemism occurs within the EMF study area (Figure 3).

**Figure 3: Centres of Endemism in and nearby the study area**



The relationship between the Centres of Endemism and the mountainous parts of the study area (shown in grey in Figure 3) are of interest from a biological point of view. The vegetation within the mountains of the study area is similar to or shows floristic gradients linking them with the Centres of Endemism, especially the Wolkberg Centre of Endemism. This suggests that the flora of

the mountains of the study area also has high levels of uniqueness, but not necessarily sufficient to warrant the classification of the Waterberg as a separate Centre. From the point of view of locating unique areas of biodiversity within the study area, the relationship suggests that the mountains of the study area should be regarded as of particular value within the study area.

### 5.3.2. Conservation areas

From a biodiversity management and conservation planning perspective, protected areas are key for meeting a number of objectives, including conservation targets for protecting representative portions of vegetation and habitats, linking landscapes, providing economic benefits, ensuring a continued supply of ecosystem goods and services and providing refugia for threatened organisms. According to the Convention on Biodiversity, “they constitute an important stock of natural, cultural and social capital, yielding flows of economically valuable goods and services that benefit society, secure livelihoods, and contribute to the achievement of Millennium Development Goals. Moreover, protected areas are key to buffering unpredictable impacts of impending climate change.”

There are a number of statutorily protected areas within the Waterberg District Municipality. These are shown in Map 20. The largest of these include Atherstone Nature Reserve, Marakele National Park, Moepel Nature Reserve, Wonderkop Nature Reserve, Masebe Nature Reserve, Entabeni Nature Reserve and Doorndraai Dam Nature Reserve (Table 6). Some of these protected areas provide the core areas that have been incorporated into the Waterberg Biosphere Reserve (see next section).

An important fact to note is that the protected area network in the study area provides protection for some of the more unique landscapes and biodiversity features in the study area, including parts of the Waterberg as well as some large wetland systems.

NAME	HECTARES
Marakele National Park	65907.924
Moepel Nature Reserve	26927.335
No Name 2	26501.097
Atherstone Nature Reserve	23606.854
Wonderkop Nature Reserve	18018.835
No Name 14	16849.374
Entabeni Nature Reserve	12054.259
Doorndraai Dam Nature Reserve	8699.061
No Name 13	8070.219
Masebe Nature Reserve	7749.428
D'nyala Nature Reserve	7265.833
Sabie Sabie Game Reserve	5891.646
No Name 20	5762.553
Bellevue Nature Reserve	5616.241
Witvinger Nature Reserve	5305.635
Hans Strijdom Nature Reserve	4992.203
No Name 15	3532.563
Nylsvley Nature Reserve	3101.335
Ben Alberts Nature Reserve	2957.942
Percy Fyfe Nature Reserve	2472.183
Madikwe Nature Reserve	2177.302
Rust De Winter Nature Reserve	1910.815
No Name 16	1863.973
Madeleine Robinson Nature Reserve	1378.508
Saanf Sanf Propety	1307.310
No Name 12	740.329
Hetbad Nature Reserve	700.054
Schuinsdraai Nature Reserve	548.037
Willem Prinsloo Private Nature Reserve	44.159
Sandf Property	27.191
Scuinsdraai Nature Reserve	24.724

**Nyala at D’Nylala Nature Reserve**



Photo: S. Taljaardt

# Waterberg District Environmental Management Framework Report

## 5.3.3. Waterberg Biosphere Reserve

Waterberg is the first region in the northern part of South Africa to be named as a Biosphere Reserve by UNESCO. Tourism is the major source of income for the people living within the Biosphere Reserve. However, people also practice cattle ranching, crop production and are increasingly switching over to game farming for eco-tourism. The biosphere reserve concept is considered to be important for helping to find a balance between the pressures of the tourist industry, the need to generate direct benefits to the local communities and the conservation of the natural assets. Attaining this balance is the goal of the Waterberg Biosphere Reserve Committee which was set up after a five year consultation process with all stakeholders concerned.

The presence of the Biosphere Reserve in the study area provides an opportunity to promote biodiversity conservation at the same time as advancing eco-tourism in the study area. The scenic splendour of the Waterberg is associated with high diversity and relatively high levels of biological uniqueness. At the same time, the Waterberg area within which the Biosphere Reserve is situated is an important and valuable water catchment area in the study area. The conservation of this part of the landscape therefore serves multiple purposes and can provide ecological benefits to an array of landscapes outside the Biosphere Reserve area.

## 5.3.4. Wetlands, riparian areas

There are a number of rivers, streams, drainage lines and wetlands in the study area. Major rivers and drainage lines in the study area are shown in Map 16. It is clear from this figure that parts of the landscape contain a high frequency of small drainage lines whereas other parts of the landscape only form the setting for larger rivers and streams to pass through.

Some of the larger perennial streams and small rivers in the study area are the Crocodile River, the Matlabas River, the Mokolo River, the Lephalala River and the Mogalakwena River, all of which drain into the Limpopo River that runs along the north-western boundary of the study area. All of these originate within

the Waterberg area. The Nyl River, which feeds one of the most important wetland systems in the Limpopo Province, is one of the upper reaches of the Mogalakwena River. Nylsvlei is a RAMSAR site and contains unique biodiversity and ecosystem processes. The entire catchment of Nylsvley is within the south-eastern part of the study area, originating within parts of the Waterberg. There are some small tributaries of the Olifants River draining the south-eastern part of the study area.

Perennial and non-perennial rivers and streams represent a number of ecological processes including groundwater dynamics, hydrological processes, nutrient cycling and wildlife dispersal. They are also an important and variable habitat for a variety of organisms. They provide a connecting network through the landscape that provides a unique feature for linking dispersed patches of natural habitat, especially in landscapes that have undergone high levels of transformation. Wetlands, rivers and streams are protected under the National Water Act.

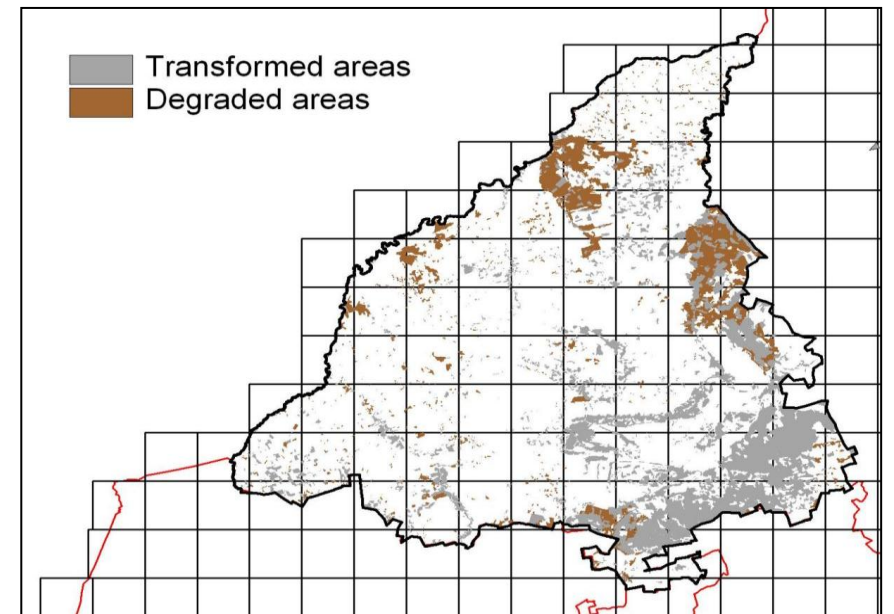
## 5.3.5. Habitat transformation in the study area

There are significant parts of the study area that have been transformed by urbanisation, cultivation or mining. The natural habitat in these areas is lost. There are also areas that still contain natural habitat, but it is degraded, usually by severe over-grazing. An indication of areas that have been transformed or degraded is provided in Figure 4.

This ecological assessment identifies those parts of the study area that have high conservation value or contain threatened organisms. Areas containing untransformed natural vegetation, high diversity or habitat complexity, Red List organisms or systems vital to sustaining ecological functions are considered sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to have low sensitivity. The information provided in the preceding sections was used to compile a map of remaining natural habitats and areas important for maintaining ecological processes in the study area as well as areas containing unique biodiversity.

Biodiversity hotspots and conservation priorities in the study area should be preserved before transformation leads to the loss of the entire area. The area is a vital ecological link between the Limpopo River and the Waterberg. Significant parts of this landscape need to be retained to avoid degradation of the entire Waterberg area.

Figure 4: Transformed Areas



Aloe commonly called “Red Hot Poker”



Photo: S. Taljaardt

# Waterberg District Environmental Management Framework Report

## 5.4. DISCUSSION AND CONCLUSIONS

From an ecological perspective, it was determined which features in the area have a high value. There are many vegetation types that occur in the study area, most of which are part of the Savanna Biome. These vegetation types are classified into different conservation categories based on the degree of transformation and conservation. A small number of these were identified as having high conservation status. Any remaining untransformed areas within these vegetation types are considered to be ecologically sensitive.

Other factors that may lead to parts of the study area having high ecological sensitivity are the presence of rivers, streams, drainage lines and wetlands, presence of steep slopes or mountains and the potential presence of various plant and animal species of conservation concern.

Mountains and ridges are considered to have high ecological value due to the ecological processes that they support. Mountains and drainage lines (wetlands) represent particularly vital natural corridors as they function both as wildlife habitat, providing resources needed for survival, reproduction and movement, and as biological corridors, providing for movement between habitat patches. Both functions are potentially critical to conservation of biological diversity as the landscape becomes increasingly fragmented into smaller, more isolated patches (Rosenberg *et al.*, 1997).

Other than protected ecosystems and threatened plant and animal species, forests and wetlands are both protected under national legislation (National Forests Act and National Wetlands Act respectively). Any impacts on these features would require a permit from the relevant National Department. There are various tree species that are protected under the National Forests Act that have a geographic distribution that includes this area. Any impacts on individuals of any of these species require a permit from the National Department.

An assessment of Red List and Orange List plant and animal species that could occur in the study area indicates that only a small number of these are in high conservation categories (CR, EN or VU). The distribution of these species in the landscape provides additional support for classifying certain parts of the landscape into higher conservation categories.

### Rhino in D'nyala Nature Reserve



Photo: S. Taljaardt

Most of the study area appears to still be in a natural condition, although significant parts may be degraded due to commercial livestock farming, cultivation and alien plant invasions.

Taking all these factors into consideration, it was possible to identify those parts of the study area that have a high ecological value. A summary of the most important of these is as follows:

1. The Waterberg: this area is identified as being of elevated biodiversity value. It also contains a number of protected areas and the important Waterberg Biosphere Reserve. In addition, the Waterberg constitutes a vital water catchment area within the study area, the function of which is critical to maintain for ecological and other reasons.

2. Springbokvlakte: this area contains a vegetation type of elevated conservation value. The area has been transformed to a high degree and remaining natural habitat needs to be conserved in order to retain components of this ecosystem and its biodiversity in the landscape. There are some threatened organisms that occur within this area which also require protection. The Nyl River is situated within this area.
3. Perennial rivers: the main perennial rivers draining the study area as well as the Limpopo River are vital hydrological features in the landscape and also provide vital ecological corridors through the landscape.

There are other natural features in the landscape that do not emerge as having high conservation status, but they do nevertheless have high ecological value. The Limpopo River valley and the bushveld on the low-lying plains to the north-west of the Waterberg are relatively intact. Components of this landscape should be preserved before transformation leads to the loss of the entire area. The area is a vital ecological link between the Limpopo River and the Waterberg. Significant parts of this landscape need to be retained to avoid degradation of the entire Waterberg area.

### Giraffe in D'nyala Nature Reserve

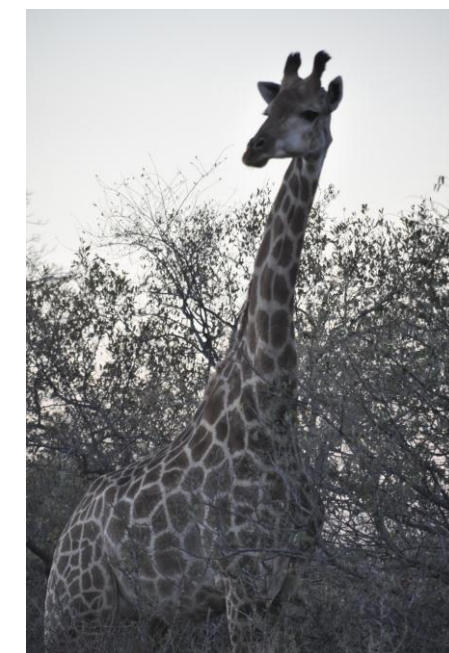
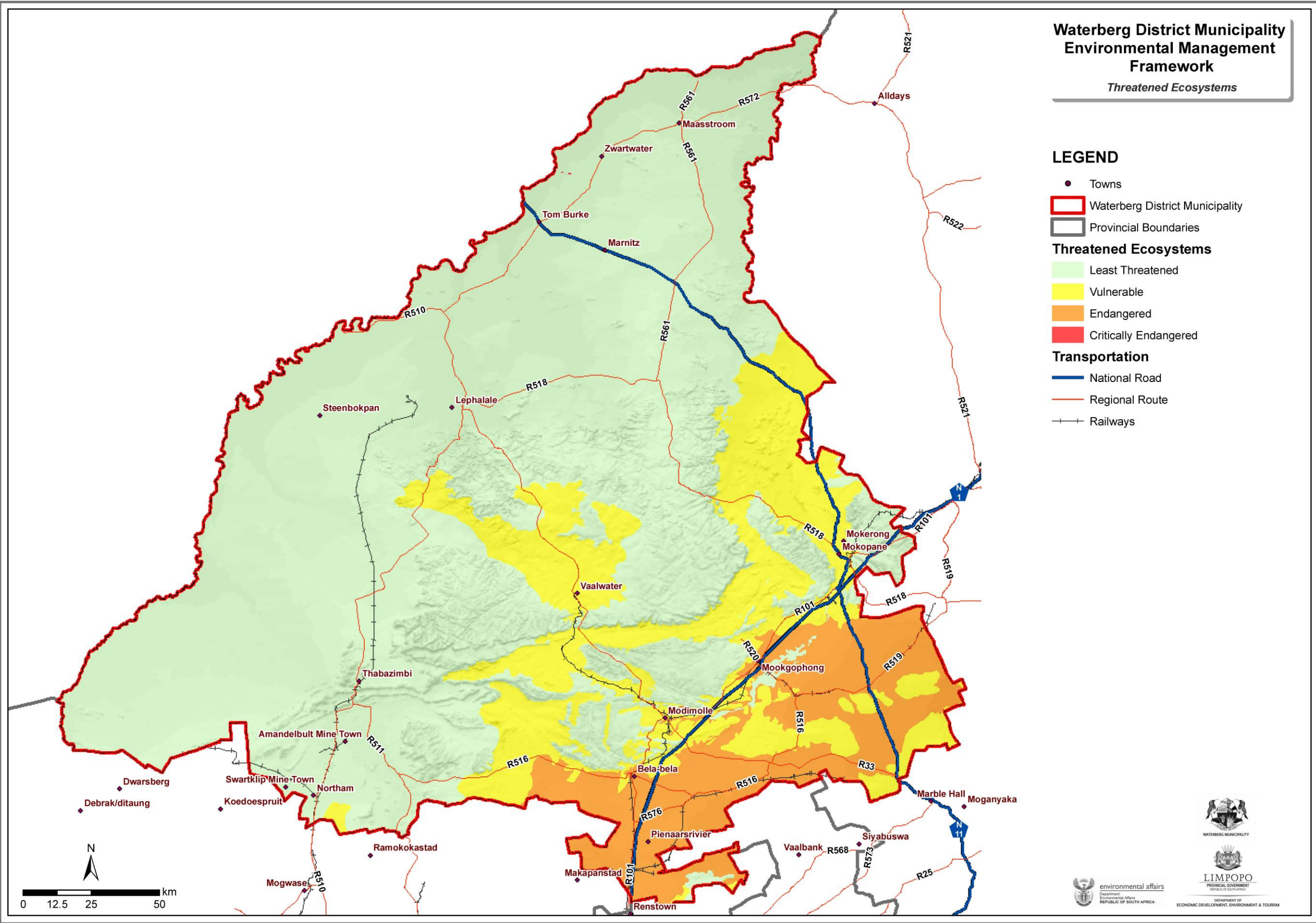


Photo: S. Taljaardt

# Waterberg District Environmental Management Framework Report

Map 21: Threatened Ecosystems



## 6. CULTURAL AND HISTORICAL FEATURES

### 6.1. INTRODUCTION

The Waterberg District has a rich and varied history. This history extends back as far as the Stone Age, and was greatly influenced by natural phenomena and features of the area. Important cultural and historical features of the area include rock paintings, clay pottery and ruins such as that of the Langa Ndebele.

### 6.2. THE HERITAGE CHARACTER OF THE WATERBERG DISTRICT

Human history in the Waterberg District is closely linked to the natural phenomena and features such as the mountains, plains, minerals, grass velds and water resources in the district. Rainfall, seasonal fluctuations in temperatures and general climatic conditions were not constant and many of these fluctuations challenged human adaptation as it offered opportunities and constraints to bands of hunter-gatherers, complex farming communities, specialists such as metal workers or entrepreneurial traders in the past. Considering the depth of time associated with human occupation of the district, namely three million years in the Makapan Valley, it can be accepted that fluctuations over this time span were many, different in various eco-zones and probably eventful, if not disastrous, to human groups in this vast region.

The heritage character of the Waterberg District is discussed according to heritage resources that are known to exist in different areas (zones) in the district. In some instances areas equal eco-zones with distinct ecological features such as the Waterberg Mountains which was home to the Late Stone Age San hunters and Khoe Khoe herders and the numerous rock paintings and stone tools they left in rock shelters and in caves in the mountains. Mostly, however, these areas collate with the presence of historically known human groups such as the eighteenth century Bakwena Bamôgôpa who settled at clusters of koppies near Northam; the farms and towns which colonial farmers occupied along the eastern fringes of the Waterberg during the 19<sup>th</sup> century

or the plains studded with mountains and hills to the north-west of Mokopane which served as the Langa Ndebele sphere of influence from the eighteenth century onwards.

These different areas are discussed in detail in the Status Quo Report.

### 6.3. PRESSURES AND IMPACTS ON CULTURAL RESOURCES IN THE WATERBERG DISTRICT

Natural and heritage resources are generally better protected in conservation areas such as nature reserves. A limited number of nature conservancy's exist in the Waterberg District where heritage resources are protected from human interventions and development. The absence of an awareness of the significance, importance and protected status of heritage resources outside these protected areas therefore causes an unnecessary pressure on heritage resources which may not be treated with the same caution as natural and cultural resources in protected areas.

A general ignorance about the conservation value of heritage resources amongst developers, lay men and the public may cause an impact (damage, alteration, removal) on heritage resources which again creates legal liabilities to these institutions and people as they are not aware of the penalties associated with damaging heritage sites and removing artefacts from heritage sites.

All kinds of development activities can affect (damage, destroy, alter, remove) heritage resources. These development activities can only follow after the necessary environmental impact assessment studies have been conducted. Large scale development activities such as mining operations and power generation projects (with numerous spin-offs etc., town development projects, roads, railway and power lines construction, etc) near Mokopane, Lephalale, Thabazimbi and Northam are not always accompanied with compulsory Phase I Heritage Impact Assessment (HIA) studies.

Uncontrolled and unplanned development such as the establishment of informal settlements or squatter camps on the outskirts of large towns such as Modimolle, Bela-Bela, Mokopane,

Northam and Lephalale can cause the destruction of heritage resources and cultural landscapes.

The development of an increasing number of 'ecological friendly' residential areas in the Waterberg is threatening the unspoilt nature of the mountain where large numbers of undiscovered heritage resources still exist. An increase in these types of development projects with associated recreational facilities, such as roads and footpaths, provides greater access to unspoilt areas and heritage sites.

Uncontrolled recreational activities such as the absence of professional guides on walking trails in the Waterberg may lead to acts of vandalism (damage to rock art paintings) or the illegal removal of artefacts from cave sites and from rock painting sites.

Population pressure, caused amongst other by the influx of people to new work opportunities, causes homelessness and unemployment. This lead to the vandalism of cultural resources such as memorials, graves and graveyards, archaeological sites and buildings as these sites, structures and features are mostly unprotected and may be defaced, robbed and stripped from valuables.

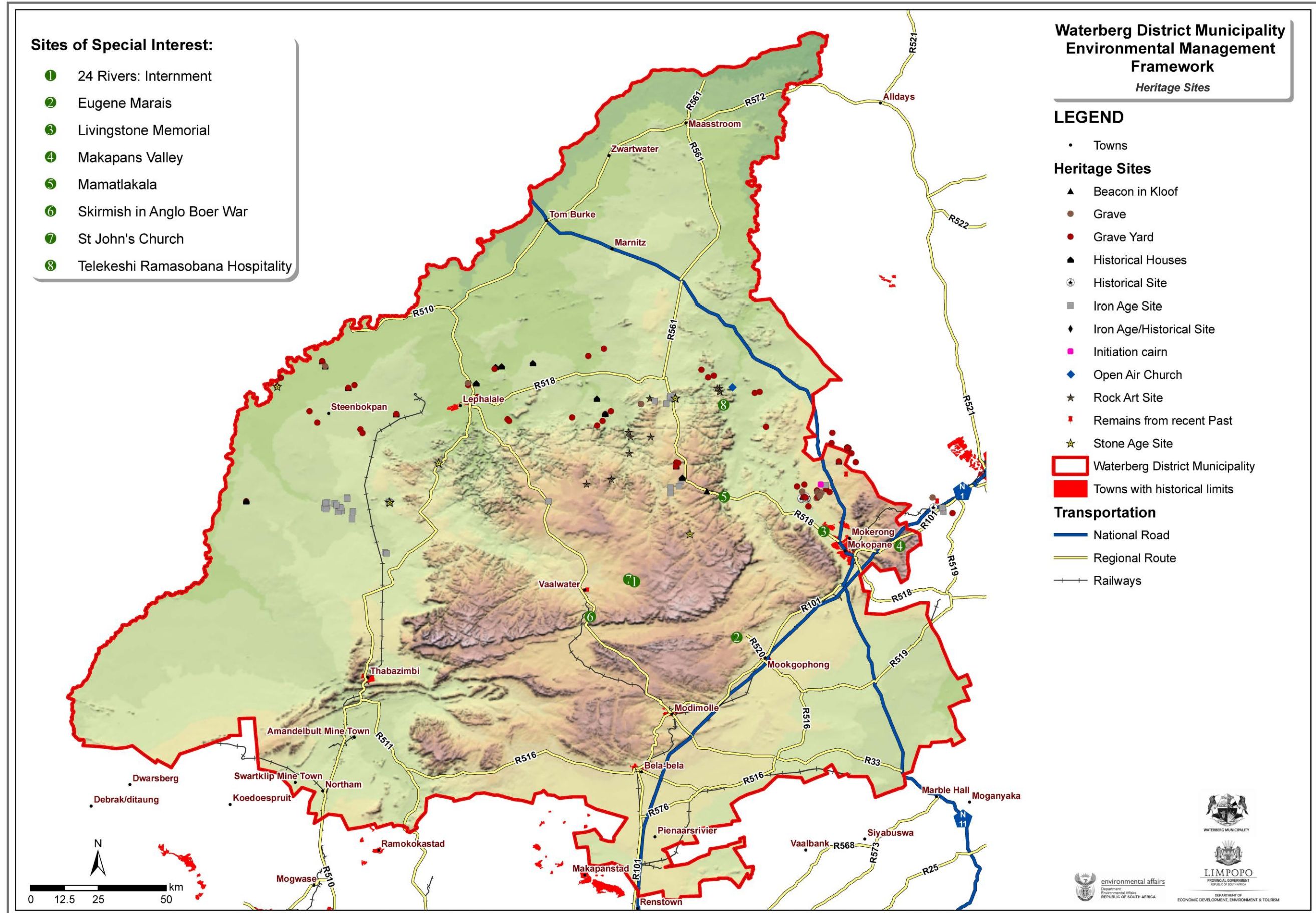
Natural processes such as soil erosion, weathering and flooding expose heritage sites and their contents from time to time. This causes irreversible damage or the destruction of heritage resources.

Increased air pollution from mining and industry may eventually cause damage to rock paintings and engraving sites.

Due to a lack of heritage research (including dedicated heritage surveys) the bulk of the Waterberg District's heritage resources have not been discovered, geo-referenced or recorded in heritage registers (kept at municipalities, museums, SAHRA's offices). The absence of a comprehensive knowledge regarding the cultural heritage of the Waterberg District inhibits utilising these heritage resources for the betterment of mankind.

# Waterberg District Environmental Management Framework Report

Map 22: Heritage Sites



# Waterberg District Environmental Management Framework Report

## 7. AIR POLLUTION POTENTIAL<sup>8</sup>

### 7.1. AIR POLLUTION SOURCES

In the Waterberg District Municipality Air Quality Management Plan, completed in June 2009, an emissions inventory for the Waterberg District was compiled for air pollution sources where information was available or where emission factors could be applied to quantify emissions.

Potential air pollution sources in the Waterberg District have been identified as:

- Power generation – Matimba Power Station is the main source of SO<sub>2</sub> emissions in Lephalale. The new Medupi Power Station will also be a significant source of SO<sub>2</sub> emissions.
- Mining – mainly fugitive dust emissions from mining activities.
- Industrial emissions – mainly emissions from small boiler sources and brickworks in the District. These sources contribute to PM10 and SO<sub>2</sub> concentrations.
- Domestic fuel burning – mainly coal and paraffin burning in informal settlements such as Mahwelereng (Mogalakwena), Marapong (Lephalale) and Regorogile and Lpeleng (Thabazimbi).
- Vehicle emissions – from petrol and diesel vehicles along major roads and the N1 highway in the District. Vehicles are not considered to be a significant air pollution source in the District.
- Agricultural activities – although not quantified, agricultural activities are considered to be an important source of ambient particulate concentrations. Thabazimbi Local

Municipality is the main contributor to agricultural activities in the District, contributing to almost 40% of the District's GDP.

- Biomass burning – also not quantified due to the irregular and seasonal nature of this source, are also considered to be an important contributor to ambient particulate concentrations, particularly during the fire-burning season.
- Waste Treatment and Disposal - there are seven licenced disposal facilities (landfills) in the Waterberg District for the disposal of general waste. Incineration occurs on a small scale in the District with medical waste from hospitals and clinics outsourced to Tshumisano Waste Management.
- Vehicle entrainment of dust from paved and unpaved roads.
- Other fugitive dust sources such as wind erosion of exposed areas.

Particulate and gaseous emissions from industrial operations, domestic fuel burning and vehicle tailpipe emissions were quantified for this assessment, due to the availability of data for these sources. Power generation was identified to be the main contributing source to PM10 emissions (68%) in the District, although this is likely to have been overestimated as many mines did not provide their emissions data, and therefore, were not possible to quantify. With the quantification of all mines in the District, mining sources are likely to be the main contributor to PM10 emissions in the District. Power generation is the main contributing source to SO<sub>2</sub> and NO<sub>2</sub> emissions in the District, contributing to 95% and 93% respectively.

**Table 7: Industrial sources and polluting factors in the Waterberg District**

Municipality	Source	Process Description	Longitude (°E)	Latitude (°S)
Bela-Bela	Bela-Bela Hospital	Hospital	28.28758	-24.88542
Lephalale	Eskom Matimba Power Station	Power Generation	27.61122	-23.66995
	Ellisras Suiwel (EDMS) Bpk	Dairy Products Processing		
	Grootegeeluk Coal Mine	Opencast Coal Mining	27.56064	-23.66275
	Hanglip Brickworks	Brick Making	27.59123	-23.68231
	Veterinary Laboratory	Veterinary Services	27.70547	-23.67536
	Witpoort Hospital	Hospital		
Modimolle	FH Odendaal Hospital	Hospital	28.42217	-24.70142
	Limpopo MDR TB Unit	Hospital	28.39458	-24.70772
	Meat Rite	Meat Processing	28.42050	-24.71575
	Nylstene (Edms) Bpk	Brick Making	28.24633	-24.59661
Mogalakwena	African Red Granite	Opencast Mining	28.70548	-23.92026
	George Masebe Hospital	Hospital		
	Midway Brick	Brick Making	29.13451	-24.13029
	Mokopane Hospital	Hospital	28.98863	-24.15351
	Nedan Oil Mills	Oil Processing	29.00811	-24.16100
	Potgietersrus Abattoir (Edms) Bpk	Abattoir	28.99808	-24.16328
	Poitgietersrus Citrus	Citrus Manufacturing	29.02222	-24.20639
	PPL Anglo Platinum	Platinum Mining	28.92422	-24.01069
	Van Erkom's Tobacco	Tobacco Manufacturing	28.98025	-24.21006
	Veterinary Laboratory (Dept of Agriculture)	Veterinary Services	29.01617	-24.20819
Mookgopong	Inca Lime	Limestone and Dolomite	29.22580	-24.48158
Thabazimbi	Amandeubult Platinum Mine (Anglo American)	Platinum Mining	27.29139	-24.82581
	Northam Platinum	Platinum Mining	27.33496	-24.80659
	Pretonia Portland Cement	Cement Making	26.83104	-24.81358
	Thabazimbi Mine	Iron Ore Mining	27.38567	-24.60608
	WES Enterprises	Animal Feeds Manufacturing	27.39806	-24.59200

### Veld Fire – Biomass burning



Photo: S. Taljaardt

<sup>8</sup> **Main source:** The Waterberg District Municipality Air Quality Management Plan completed in June 2009.

## Waterberg District Environmental Management Framework Report

Table 8: Air Pollution Sources								
Sector	Source	Description	PM10	SO <sub>2</sub>	NO <sub>2</sub>	Other	Current Number	Possible Future Number
Agriculture	Crop farms & Cattle farms	Particulates associated with wind & erosion, chemicals associated with crop spraying, and odiferous emissions resulting from manure, fertilizer and crop residue.	✓				-	-
Airports		Airports generate air pollution during airport operations, vehicle traffic, on-site fuel storage facilities as well as aircraft maintenance and operation.	✓	✓	✓	✓	No large airport currently in the area. Only a landing strip.	Densification & development of the area may result in the construction of a fully functional airport.
Biomass burning	Crop Farms, and other farms.	Burning of crop residue, and veld fires (controlled & uncontrolled).	✓	✓	✓	✓	-	Expected to increase. The uncertainty in the area is leading to poorly managed land and fire breaks which are not maintained, allowing veld fires to spread easily.
Brickworks	Brick Making Factories	Emissions result mainly from the handling of raw materials, processing and plant maintenance.	✓	✓	✓		1	1 -
Domestic fuel burning	Poorer households & rural settlements	Wood and paraffin for cooking and space heating purposes. Pollutants released from these fuels include CO, NO <sub>2</sub> , SO <sub>2</sub> , inhalable particulates and polycyclic aromatic hydrocarbons.	✓	✓	✓	✓	Estimated total domestic fuel burning emissions (Census 2001): 18 tons	May increase with influx of people. Lack of adequate housing & services may push people to make more use of wood and paraffin for domestic cooking and space heating.
Landfills	Municipal, private, mining and illegal landfills	Landfill emissions are of concern, both because of the potential negative health effects and bad odours generated. Landfills are important sources of the greenhouse gases such as CH <sub>4</sub> and CO <sub>2</sub> , which account for approximately 40 – 60% of all landfill emissions.	✓	✓	✓	✓	unknown	The number of landfills and waste generated is expected to increase with the influx of people and development of the area.
Mining	Coal mine	Opencast mining generates dust emissions, as well as spontaneous combustion of discard which will also generate CO, NO, SO <sub>2</sub> and H <sub>2</sub> S.	✓	✓	✓	✓	1	4-5 or more
	Diamond mine	Mining generates dust emissions, and the use of energy to extract the minerals also generates emissions.	✓	✓	✓	✓		
Power generation	Power stations	Coal-fired power stations emit particulates, SO <sub>2</sub> , NO <sub>x</sub> (primarily as NO with smaller quantities of NO <sub>2</sub> , CO, CO <sub>2</sub> , N <sub>2</sub> O) and trace amounts of mercury. Other sources of emission include windblown dust from the ash dumps and materials handling operations.	✓	✓	✓	✓	1-2	4-8
Large industry	Coal-to-Liquids	Coal-to-Liquids plants that convert coal into fuel.	✓	✓	✓	✓	0	1
	Coal-bed-Methane	Methane powered 300MW power station.	✓	✓	✓	✓	0	1
Small industries	Hospital	Medical services, hazardous waste incineration	✓	✓	✓		2	2 -
	Dairy products processing	Gasses such as CO <sub>2</sub> , CO, NO <sub>x</sub> and SO <sub>2</sub> be discharged.	✓	✓	✓		1	1 -
	Veterinary laboratory	Veterinary services, hazardous waste incineration.					1	1 -
Trans-boundary transport		Two sources of pollutants are important for long-range transport, biomass burning and industry.	✓	✓	✓	✓	-	-
Tyre burning		Illegal tyre burning occurs to remove the copper from the tyres as well as for space heating purposes, contributes significantly to ambient particulate concentrations.	✓	✓	✓	✓	-	-
Vehicle entrainment on unpaved roads		Dust emissions from vehicle activity on dirt roads.	✓				-	-
Vehicle tailpipe emissions		Atmospheric pollutants emitted from motor vehicles include hydrocarbons, CO, NO <sub>x</sub> , SO <sub>2</sub> and particulates.	✓	✓	✓	✓	Estimated vehicle emissions 207 tons	Vehicle emissions are expected to rise approximately 300% to 621 tons over the next 10 - 20 years as densification takes place & the area develops. <sup>9</sup>
Wind-blown dust		Wind erosion of exposed, open areas.	✓				-	-

<sup>9</sup>Source: Environomics own calculations

# Waterberg District Environmental Management Framework Report

## 7.2. ESTIMATED TOTAL EMISSIONS FOR LOCAL MUNICIPALITIES

Estimated total emissions for each Municipality in the Waterberg District indicate that for:

- Industrial and mining emissions - Lephalale Local Municipality is the major source of industrial emissions, contributing to approximately 96% of emissions in the District. Matimba Power Station and Grootegeluk Coal Mine are the main contributing sources in this Municipality.
- Domestic fuel burning emissions – Mogalakwena is the largest contributor to domestic fuel burning emissions in the District, contributing to approximately 52% of emissions.
- Vehicle emissions – Thabazimbi and Lephalale are the main contributors to vehicle emissions, contributing 28% and 24% respectively. However, the contribution of Bela-Bela, Modimolle, Mogalakwena and Mookgophong to vehicle emissions may have been under-estimated as vehicle volumes on the N1 highway could not be obtained.

The National Framework for Air Quality Management in South Africa rates the Waterberg District as having potentially poor air quality mainly due to emissions from industries. As a whole, the Waterberg District is, however, not considered to be an industrialised area as predominant activities in the area are agriculture, game farming and eco-tourism. Proposed future industrial developments will, however, make the Waterberg, in particular, the Lephalale region an important role player in air quality in upcoming years. The construction of Eskoms's Medupi Power Station has already begun with an additional two Power Stations (Coal 3 and 4) proposed in the Waterberg. Sasol has also proposed the development of a coal-to-liquids (CTL) plant in north-western part of the Waterberg District.

Within the District, most industries are located in the major towns, and along major roads connecting these towns. Mogalakwena has the highest industrial activity in the District with industries located

predominantly in the town of Mokopane. Within Lephalale, Matimba Power Station is one of the major industries within Lephalale and within the Waterberg District as a whole. Mining is the predominant activity in Thabazimbi while Bela-Bela, Modimolle and Mookgophong have very few industries.

Based on information obtained from the Limpopo Province, the APPA Registration Certificate Review Database and an area wide site visit, the main industrial sources within each Local Municipality have been identified to be:

- Bela-Bela – There are no industrial sources in this town. Bela-Bela hospital has a boiler, which is in the process of being decommissioned.
- Lephalale – Exxaro Grootegeluk Mine, Ellisras Suiwel and Witpoort Hospital. Scheduled processes include the Veterinary Laboratory (Department of Agriculture) and Matimba Power Station.
- Modimolle – FH Odendaal Hospital and Meat Rite. Nylstene brickworks is the only scheduled process in Modimolle.
- Mogalakwena – Van Erkoms Tobacco, Nedan Oil Mills, Potgeitersrus Citrus, African Red Granite, PPL Anglo Platinum, George Masebe Hospital and Mokopane Hospital. Scheduled processes include the Potgietersrus Abbatoir (boiler decommissioned), Veterinary Laboratory (Department of Agriculture) and Midway Bricks.
- Mookgophong – The only mine in this Municipality is Inca Lime Mine.
- Thabazimbi – Thabazimbi Mine and Amandelbult Platinum Mine. Scheduled processes include Northam Platinum, WES Enterprises and PPC Cement.

## 7.3. AIR QUALITY PRIORITY AREA

In the intention and process to declare parts of the Waterberg District a Priority Area in terms of air pollution, even though there is

currently no existing major air pollution problem, there are indications that the government recognises the potential for a problem to occur. In pro-actively declaring a Priority Area it is hoped that measures will be put into place to ensure that air pollution is managed correctly, and does not reach a level where it becomes a danger to the health of those who live there.

## 7.4. CURRENT AND FUTURE POLLUTING DEVELOPMENTS

The large quantity of coal reserves in the coal field found near Lephalale makes the area likely to develop further as the reserve is unlocked. Current developments include the expansion of the existing mine, upgrading of the existing Matimba power station, and the building of the new Medupi power station.

Future developments include a possible coal-to-liquids plant, methane fuelled power station, further mining. These developments will likely attract large industry to the area. Human settlement development will also as a result increase. The result of these developments will include higher traffic volumes.

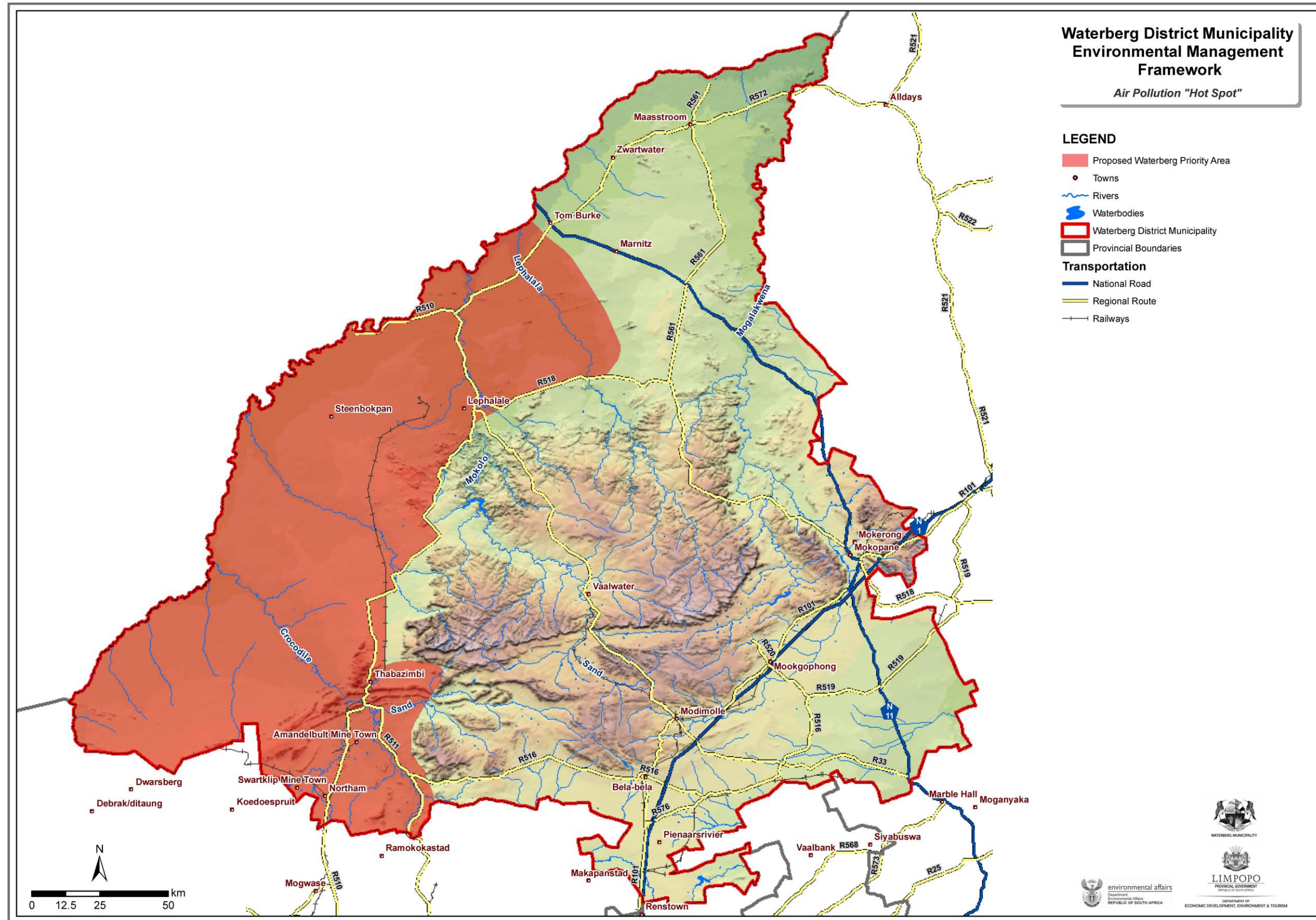
These developments have the potential to create a hazardous air pollution problem in the Lephalale area. It was agreed by the authorities that the National Standard should be maintained and considered the “cap” or “ceiling” for air quality. The National Air Quality Standards should not be surpassed. Once the air quality has reached National Standards, no further air polluting activity should be allowed, unless compensation, with pollution reduction in existing activities takes place.

## 7.5. NECESSARY INFRASTRUCTURE

In order to ensure that air pollution remains within manageable parameters, certain infrastructure is necessary. This includes air quality monitoring stations at strategic position both within the priority area as well as outside of it. It is important to get such stations running as soon as possible in order to have data that can be used comparatively. Competent licensing authorities as well as monitoring personnel are needed to ensure that the management of air pollution is effective

# Waterberg District Environmental Management Framework Report

Map 23: Air Pollution “Hot Spot”



## 8. ECONOMIC CHARACTERISTICS AND DRIVERS

### 8.1. ECONOMIC PROFILE OF WATERBERG DISTRICT MUNICIPALITY

Compared with other districts in Limpopo, Waterberg District Municipality presents greater prospects for growth in all sectors in terms of GDP, employment and population. Mining, agriculture, and tourism sectors serve as a backbone for growth and have a potential of triggering growth of other sectors such as transport, construction and trade.

#### 8.1.1. GDP and formal employment outlook

Waterberg's main GDP contribution, by far, comes from the mining sector with a share of almost half (49%) of the GDP in the District, followed by the finance sector (11%).

#### 8.1.2. Growth, development & economic character

Waterberg has experienced steady but relatively modest growth between 2001 and 2007 in terms of employment with the exception of agriculture and community services, which respectively shed 54% and 90% jobs during the same period. Figure 5 presents an interesting observation that majority of sectors both small and big registered negative GDP growth between 2003 and 2005. Although there seem to be more jobs created in the Waterberg the beneficiation from various industries may be enjoyed outside the District

Although mining is by far the biggest contributor to the GDP, it comes second (16%) in terms of employment after the agriculture sector (26.98%). Even though agriculture creates more jobs it is one of the smallest contributors to the total GDP with a share of approximately 3%. The rate (69%) in which mining created employment between 2001 and 2007, signals a trend that mining will become the biggest employer in the near future whereas agriculture registered negative growth of 54%. This phenomenon is best explained by the ability of mining and related sectors such

as manufacturing, transport and construction which registered 51%, 38% and 24%, respectively, to attract skilled labour and compensate them better than the agricultural sector.

For agriculture to survive the threat of losing skilled labour and possibly cease to exist, it has to compete and offer better incentives. Investments in agricultural sector must be encouraged and grow with investments in other sectors in order to keep it competitive in the market.

#### 8.1.3. Population

In terms of the population outlook three local municipalities registered positive growth with Modimolle registering the biggest growth of 70% followed by Mogalakwena at 27%. The latter municipality has the biggest population (55%) in the District and contributes the third largest (16%) GDP. Thabazimbi contributes the largest GDP (36%) whereas the size of its population is the third largest in Waterberg. Mookgophong has the smallest population (2.88%), and equally the smallest GDP contribution. Mookgophong registered biggest (-44%) negative population growth. The change of municipal demarcation may have impacted largely in these anomaly population growth trends.

More detailed information with further figures on the GDP per sector for each municipality may be viewed in the Status Quo Report.

## 8.2. ECONOMIC TABLES AND GDP CONTRIBUTIONS

### 8.2.1. Contribution % to gross value added (GVA) 2004

	Agriculture hunting forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water supply	Construction	Wholesale and retail trade	Transport, storage and accommodation	Financial, insurance, real estates and	Community, social and personal services	Total
<b>Waterberg</b>	0.51	3.80	4.77	- 0.83	7.58	9.80	12.17	6.70	0.99	3.76
Thabazimbi	0.51	2.88	7.58	- 0.36	12.33	15.86	13.31	10.34	0.99	3.75
Lephalale	0.51	5.71	3.55	- 0.98	7.37	11.47	13.20	7.71	0.99	3.21
Mookgopong	0.52	40.54	4.53	1.18	7.42	11.69	10.23	5.38	0.99	4.66
Modimolle	0.52	42.58	7.57	3.83	12.81	15.96	20.48	5.54	0.99	6.04
Bela-Bela	0.52	43.01	8.21	5.47	13.28	16.73	22.19	5.55	0.99	5.94
Mogalakwena	0.51	41.89	1.40	2.39	2.43	3.60	5.33	0.64	0.99	3.64

### 8.2.2. Growth per sector of the Waterberg District (2002-2004)

The sectors that experienced significant growth during 2002-2004 include the electricity and water, transport and communication, finance and trade and mining. The agricultural sector also showed significant growth in 2004.

Sector	2002	2003	2004
Agriculture, forestry and fishing	2.0%	- 4.9%	8.9%
Mining	3.9%	2.4%	9.0%
Manufacturing	0.2%	5.7%	6.5%
Electricity and water	18.8%	7.3%	5.0%
Construction	- 16.1%	6.0%	-2.2%
Wholesale and retail; catering and accommodation	1.0%	3.1%	5.4%
Transport and communication	7.2%	5.9%	25.0%
Finance and business services	5.9%	7.7%	3.8%
Community, social and other personal services	5.3%	2.6%	3.4%
General government services	0.8%	1.3%	0.8%

# Waterberg District Environmental Management Framework Report

Figure 5: Waterberg Sectoral GDP% contribution

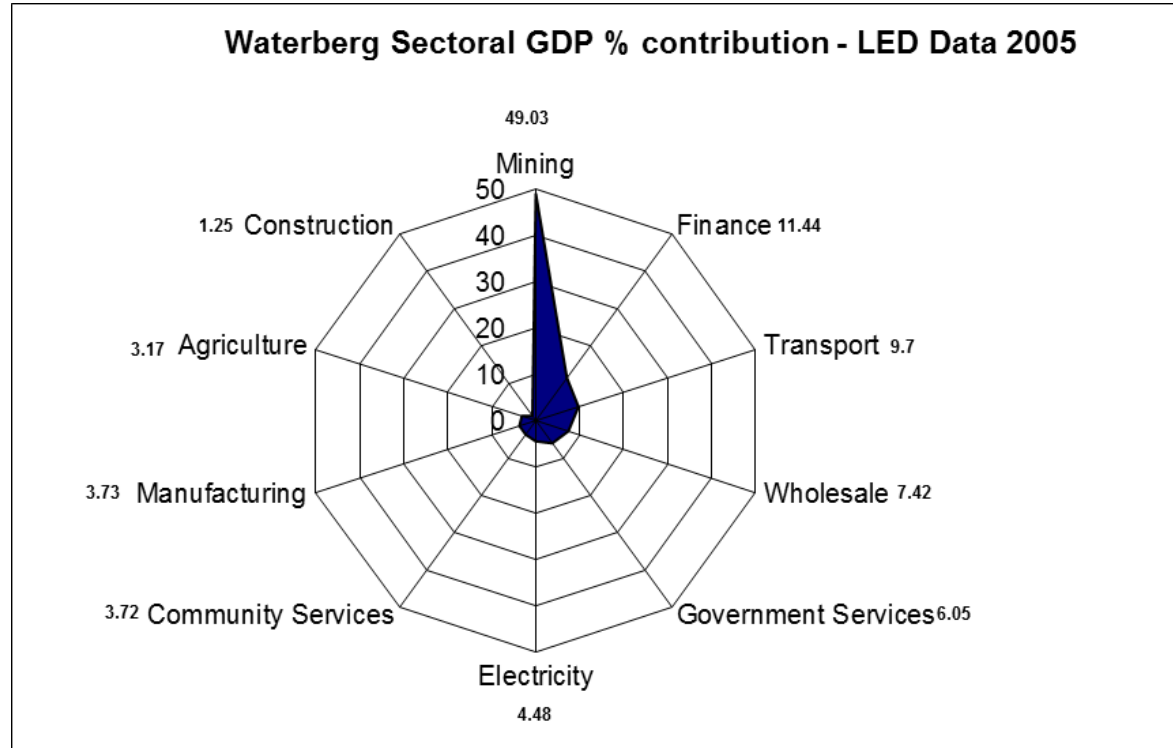


Figure 6: Waterberg Sectoral GDP growth %

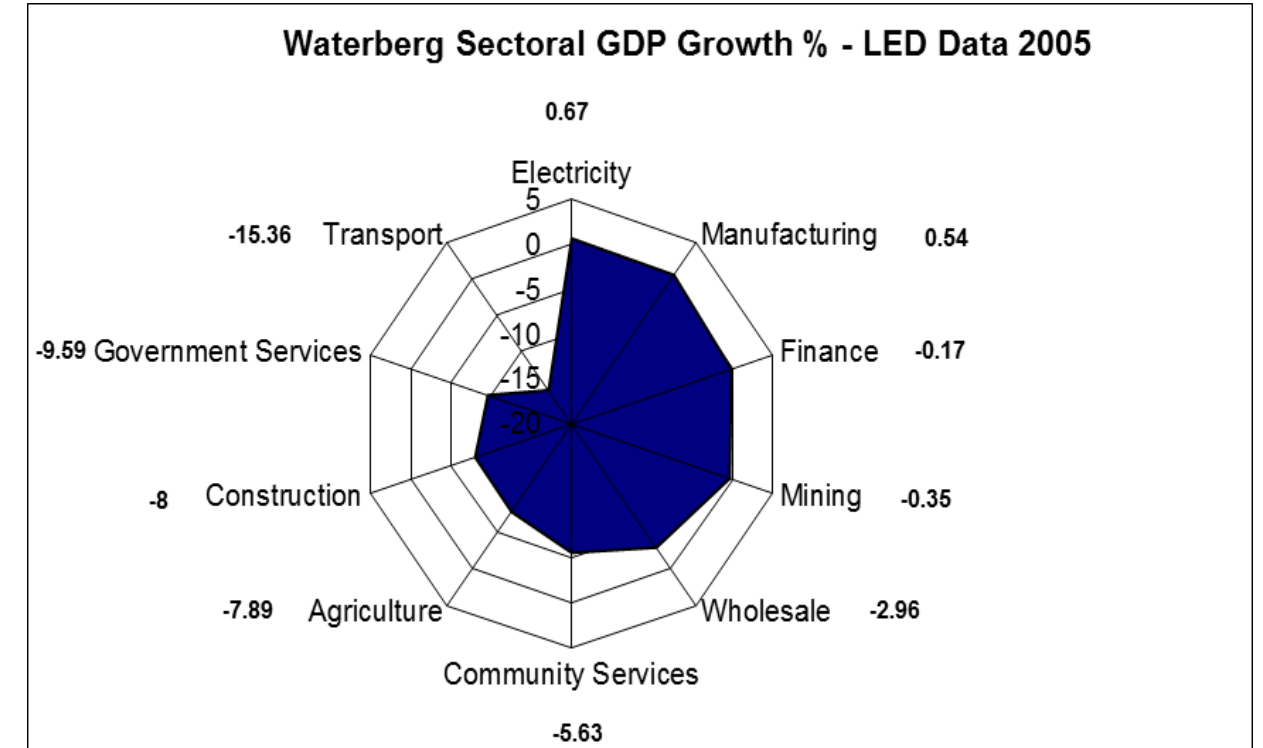


Figure 7: Waterberg Local Municipalities GDP% contribution

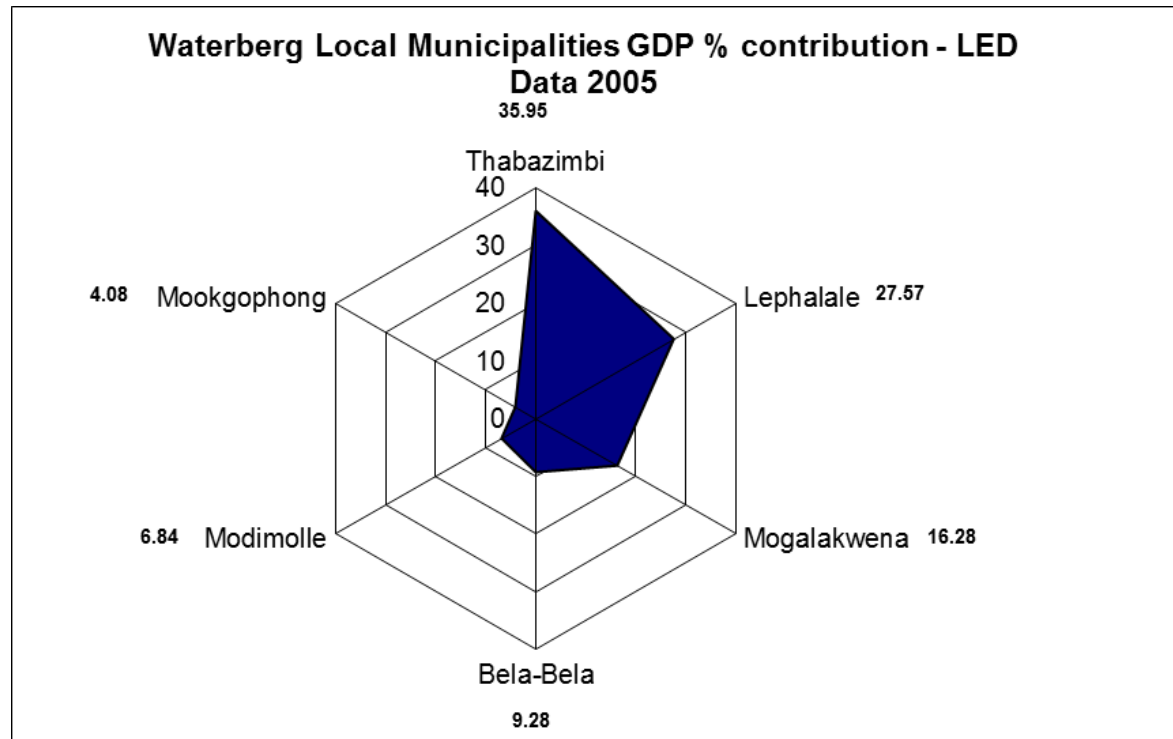
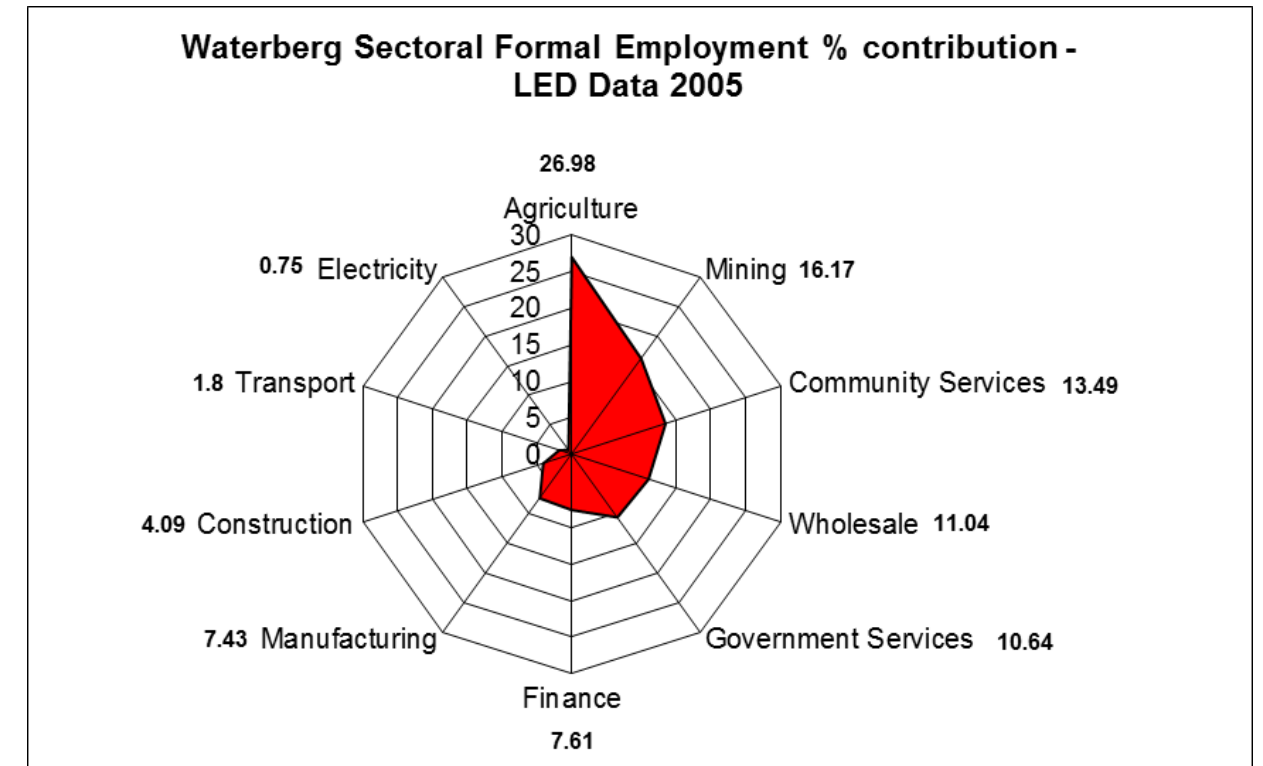


Figure 8: Waterberg Sectoral Formal Employment % contribution



# Waterberg District Environmental Management Framework Report

## 9. POPULATION CHARACTERISTICS

According to the 2007 population data the Waterberg District Municipality area has an estimated total population of 572 625. This is a drop compared to the 2001 population data which indicated an estimated population of 614 157. Most of the people in the District are distributed around Mogalakwena, Lephalale, as well as the Thabazimbi local municipality areas respectively. The local municipalities located on the south-eastern part of the District are the least populated. Bela-Bela, Modimolle and the Mookgophong local municipalities are located in the south-eastern part of the district. The Mogalakwena Local Municipality is the most populated area with an estimated total population of 330 742 whilst the Mookgophong local municipality area is the least populated area with an estimated total population of 17 183.

The education levels in the Waterberg area dropped in 2007 compared to the 2001 data. This can be attributed to the drop of the population in the area. The majority of the area's population has primary to secondary education with most of the working population earning between R1 to R400 and R6401 to R12 800 per month.

The biggest contributors to employment in the Waterberg District are mining and quarrying, wholesale and retail trade, agriculture, hunting and fishing, as well as the manufacturing sectors, with the percentage representation of the different sectors being 6.5%, 5.5%, 4.6%, and 3.7%. In the context of the EMF mining, agriculture and the manufacturing sectors play an important role in the economy of the region, in improving livelihoods and sustaining the regional economy. Even more important is the contribution of these sectors to the Gross Geographic Production (GGP) of the region, which have been highlighted as important growth sectors in the Limpopo Growth and Development Strategy 2004.

Age	2001			2007		
	M	F	Total	M	F	Total
0-4	33088	33264	66352	31239	33406	64645
5-9	37088	36281	73369	33671	32207	65878
10-14	37261	37372	74633	32924	33317	66241
15-19	35635	36176	71811	32537	32459	64996
20-24	26399	28488	54887	28132	25298	53430
25-29	23286	26763	50049	25484	21947	47431
30-34	19499	21553	41052	23069	21450	44519
35-39	18104	20469	38573	17396	17105	34501
40-44	15685	16355	32040	14817	16296	31113
45-49	12324	14074	26398	13508	3183	16691
50-54	9751	10526	20277	9899	1196	11095
55-59	7141	7807	14948	9193	9553	18746
60-64	6571	8944	15515	6644	7196	13840
65-69	4423	6893	11316	4840	9724	14564
70-74	3850	6186	10036	3539	5684	9223
75-79	2221	3240	5461	2505	5389	7894
80-84	1653	2903	4556	909	2462	3371
85+	962	1922	2884	1283	3164	4447
<b>Sub-total</b>	<b>294941</b>	<b>319216</b>	<b>614157</b>	<b>291589</b>	<b>281036</b>	<b>572625</b>

Income	2001			2007		
	M	F	Total	M	F	Total
No income	1380	1433	2813	107380	137008	244388
R 1- R 400	19849	22158	42007	66845	70755	137600
R 401- R 800	19873	12193	32066	18399	22267	40666
R 801- R 1600	15451	6156	21607	18193	42962	61875
R 1601- R 3200	14584	5601	20185	12869	6474	19243
R 3201- R 6400	8838	4880	13718	14334	7720	22054
R 6401- R12800	4325	1207	5532	9244	7162	16406
R 12801- R 25600	1276	212	1488	4141	1659	5800
R 25601- R 51200	392	125	517	1634	461	2095
R 51201- R 102400	203	65	268	532	319	851
R 102401- R 204800	93	27	120	445	62	507
R 204801 or more	38	19	57	247	85	332
<b>Sub-total</b>	<b>86302</b>	<b>54076</b>	<b>140378</b>	<b>254983</b>	<b>296834</b>	<b>551817</b>

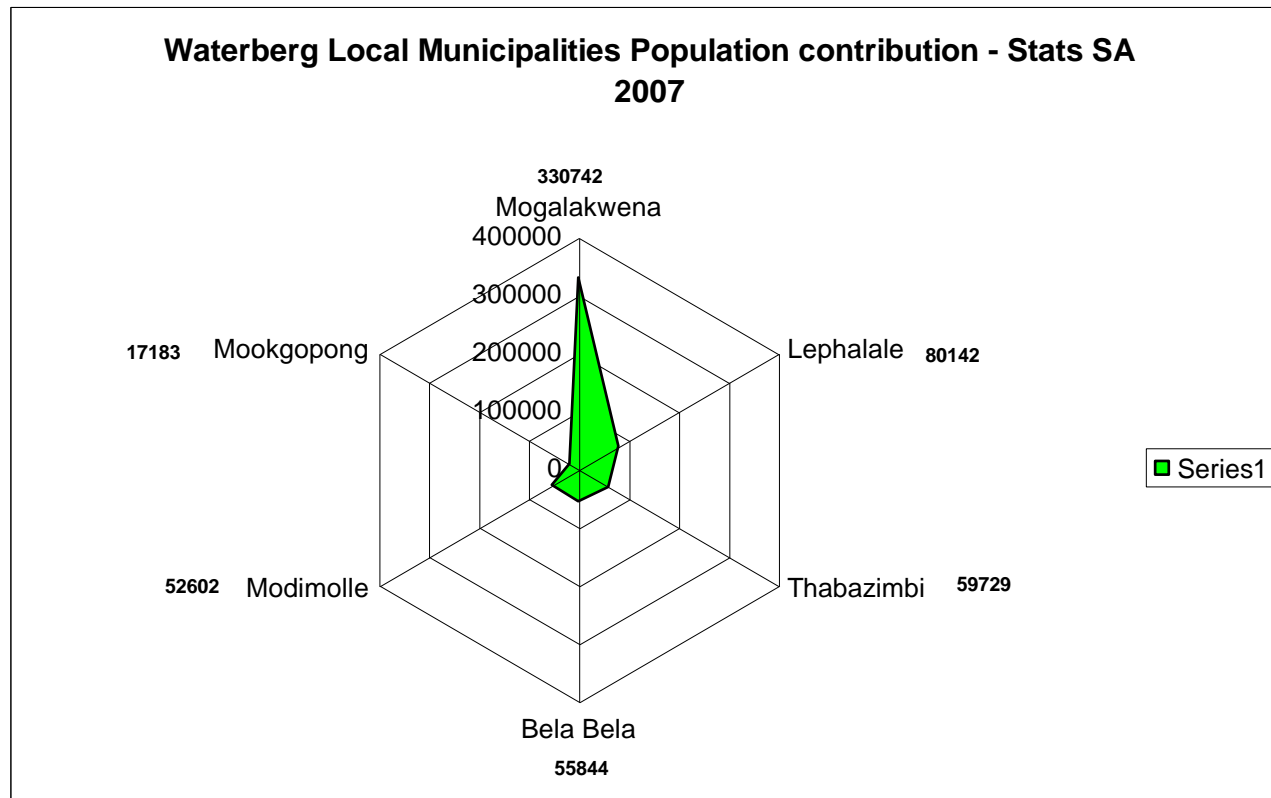
	2001			2007		
	M	F	Total	M	F	Total
No schooling	33940	50556	84496			
Some primary	31512	31456	62968			
Complete primary	10737	11445	22182			
Some secondary	42957	47193	90150			
Grade 12/ Stnd 10	23120	24560	47680			
Higher	9607	10910	29517			
<b>Sub-total</b>	<b>151873</b>	<b>176120</b>	<b>327993</b>			
Pre- school				4778	3563	8341
Primary				45038	45285	90323
Secondary				42411	43184	85595
College				1159	1192	2351
University /Tech				619	879	1498
Adult basic				0	0	0
Other				474	293	727
Not applicable				29389	27501	56890
Unspecified				1210	1535	2745
Institutions				1850	1750	3600
<b>Sub-total</b>	<b>126928</b>	<b>125142</b>	<b>252070</b>			

The 2007 Community Survey shows a decrease in education levels in the Waterberg compared to the 2001 census data (Table 14). This can be attributed to the lower population recorded in the Community Survey for the area. The majority of the population have primary to secondary education, with the majority of the working population in the income categories R1 to R400 and R6401 to R12 800 per month.

Sectors	2001			2007		
	M	F	Total	M	F	Total
Agriculture; hunting and fishing	22659	11141	33800	11194	4490	15684
Mining and quarrying	12492	586	13078	20216	1887	22103
Manufacturing	5972	2378	8350	8970	3600	12570
Electricity; gas and water supply	1066	165	1231	1013	315	1364
Construction	6318	680	6998	7641	1002	8643
Wholesale and retail trade	9266	7499	16765	10974	7641	18615
Transport; storage and communication	2777	551	3328	3071	1510	4581
Financial; insurance; real estate and business services	3360	1988	5348	5598	3118	8716
Community; social and personal services	10720	10421	21141	9161	12967	2212
Other and not adequately defined	0	0	0	4601	10321	14922
Private households/ not applicable	6259	14709	20968	89794	126649	216443
Undermined	4353	3963	8316	6154	5694	11848
<b>Sub- total</b>	<b>85242</b>	<b>54081</b>	<b>139323</b>	<b>178387</b>	<b>179230</b>	<b>337701</b>

# Waterberg District Environmental Management Framework Report

Figure 9: Waterberg Local Municipalities Population contribution

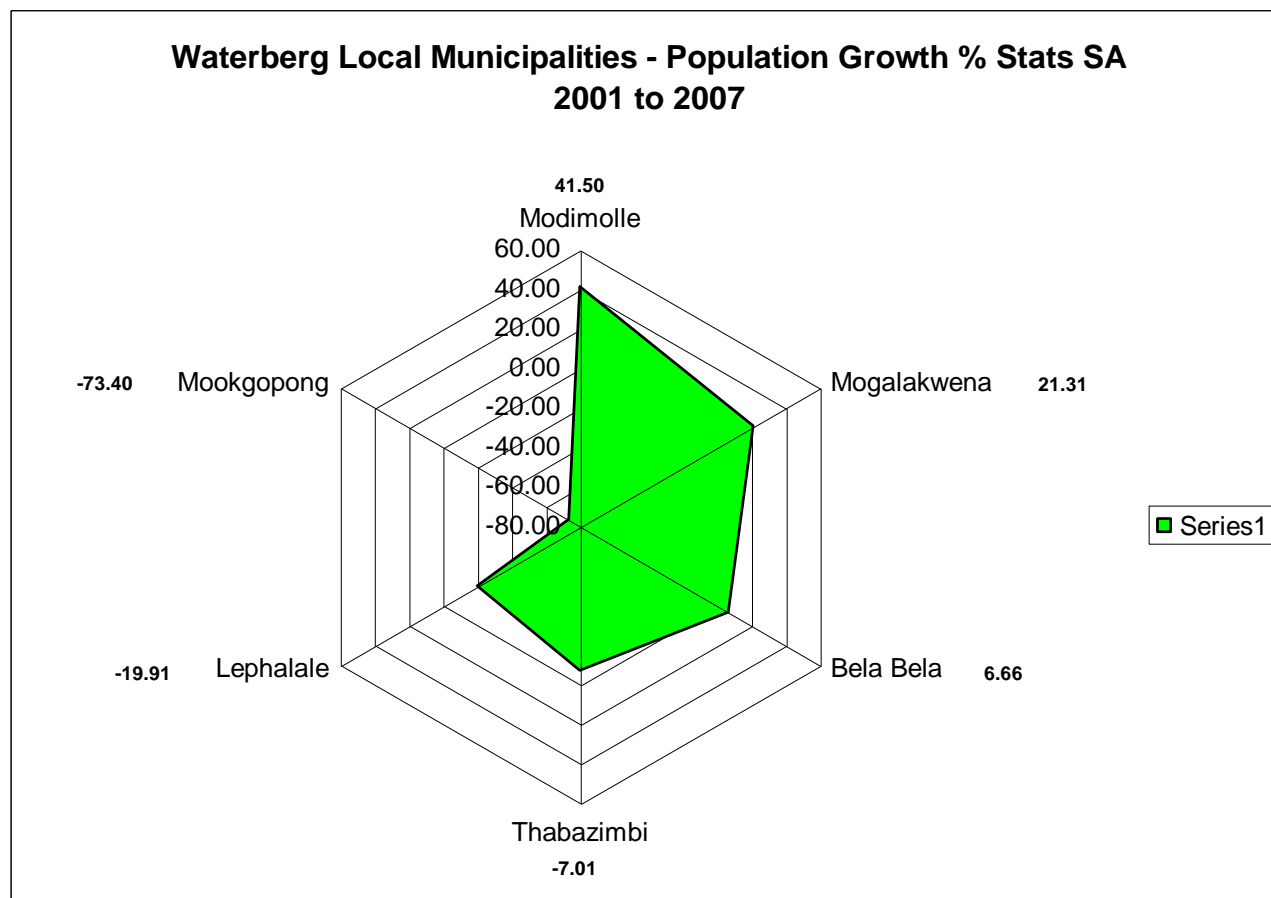


The Black Mamba Curio Shop in Vaalwater



Photos: S. Taljaardt

Figure 10: Waterberg Local Municipalities Population Growth



Rural Settlement in Lephale



Photos: S. Taljaardt

# Waterberg District Environmental Management Framework Report

## 10. DEVELOPMENT PATTERN

The development pattern is established over years of economic development and is expressed in terms of human settlement and infrastructure in support of these economic activities. The development pattern is also influenced by climate and physical factors, in particular the topography. The development pattern is further described in terms of economic development, human settlement and infrastructure.

### 10.1. ECONOMIC DEVELOPMENT PATTERN

The economic development patterns are discussed below. The primary and secondary activities were investigated. Details on the tertiary activities can be found in the Status Quo Report.

#### 10.1.1. Primary activities<sup>10</sup>

##### 10.1.1.1. Mining

The exploitation of minerals such as iron, platinum and coal has led to the development of nodes which have grown into the largest of the towns in the district. With the exception of iron, the mineral potential in the district is large enough to spur further growth of existing nodes such as Lephalale and Mokopane, and even the development of new settlements in undeveloped areas. The direct impact of mining expansion is the loss of farmland.

##### 10.1.1.2. Areas with dominant mining potential

Lephalale is one of the areas with dominant mining potential. Plans to expand the current coal mine and the addition of a new coal mine are already being discussed. This development is to coincide with the upgrading of the existing Matimba Power Sstation and the development of a new coal fired power station.

The possibility of establishing another platinum mine, as well as the expansion of the existing mine in Mokgale exists.

##### 10.1.1.3. Agriculture

Commercial farming mainly occurs on the “Springbok flats” in the south-east of the district, towards Marble Hall, as well as the broad valley towards Alma. Game farming occurs in the Waterberg and Steenbokpan area. Cattle farming has gradually given way to game farming. The impact of agriculture is the loss of biodiversity due to the planting of crops. Overgrazing and poor land management also contributes to the loss of biodiversity where game numbers are not controlled on farms.

##### 10.1.1.4. Areas with dominant agricultural potential

The Lephalale Municipality proposes to expand the existing agriculture activities and the expansion of the irrigation scheme already in place.

The Modimolle Local Municipality area has an active agricultural sector, which the Municipality hopes to expand and strengthen. Some of the development projects and opportunities that have been identified by the Municipality include:

- Alma hydroponics;
- Meropa vegetables;
- Waterberg Agriculture training project;
- Limpopo Dipudi project, which is a goat abattoir;
- LDA Leseding poultry project in Vaalwater;
- the Busy Bee aquaculture project;
- community game farm projects;
- organic vegetable projects; and
- venison processing project

The Mookgophong Local Municipality area has a very dominant agricultural sector, which the Municipality hopes to expand and strengthen. Some of the development projects and opportunities in the area that have been identified by the Municipality include:

- Paprika production under the irrigation schemes;
- expansion of citrus production in Nyl/Mokgalakwena;
- spices and granadilla production in Nyl/Mokgalakwena;
- meat processing in Naboom;
- hydroponics in the Springbok flats; and
- game farming in the Tambotie floodlands.

#### 10.1.2. Secondary activities<sup>11</sup>

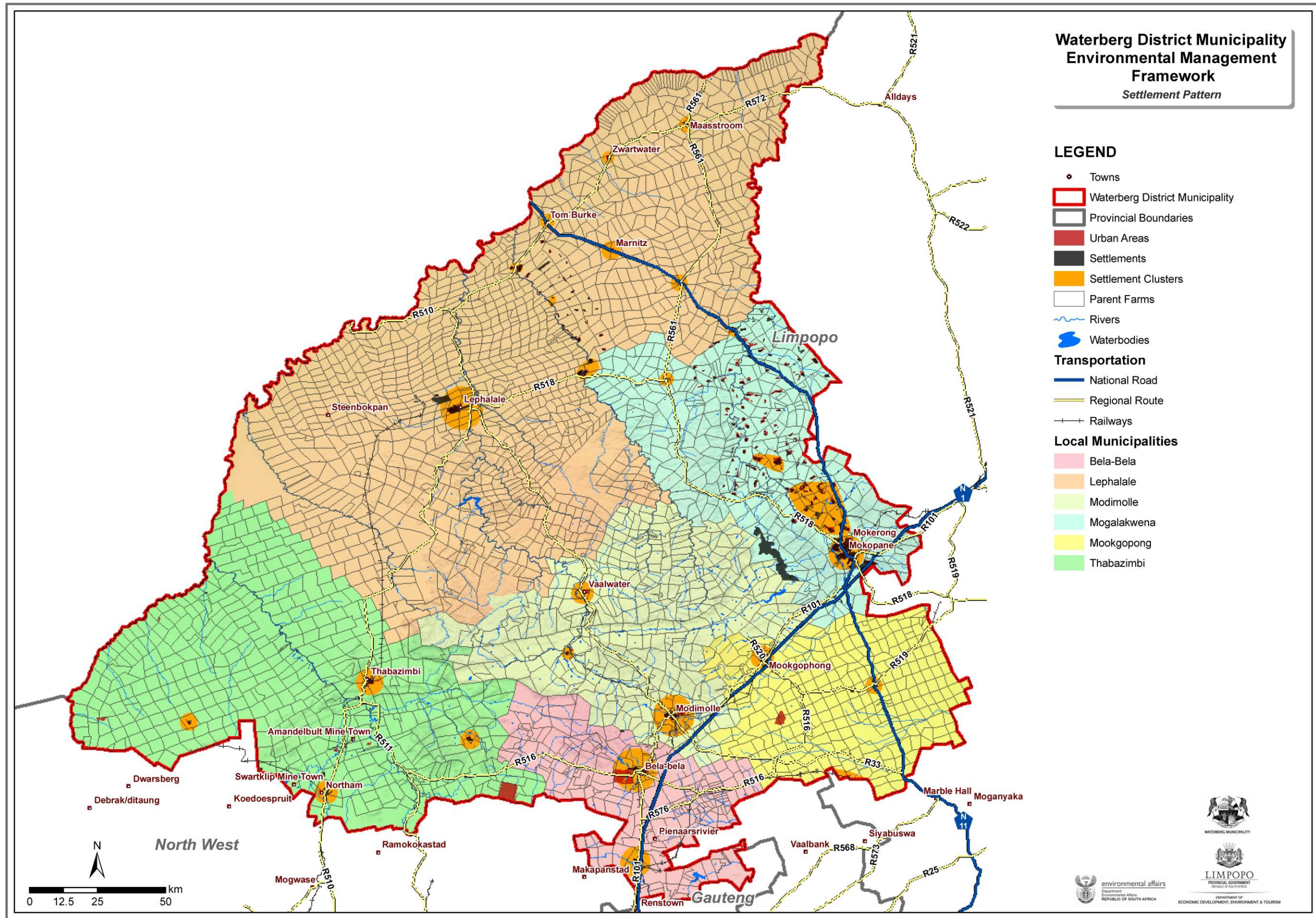
##### 10.1.2.1. Industrial development

In context with the district at large, little industrial development has taken place. The power stations near Lephalale (Matimba and Medupi) are singled out as the first heavy industrial development in the district. Small scale manufacturing and service industries are located in Bela-Bela, Thabazimbi and Mokopane. At present growth in the manufacturing sector is slow because the sector is too small to attract more industries, and it is not well located in terms of existing markets (Thabazimbi Municipality Integrated Spatial Development Framework, 2008). Proclaimed industrial townships in Mogalakwena and Bela-Bela have no significant growth, as is evident from vacant stands that remain undeveloped. (Mogalakwena Spatial Development Framework, 2009 & Bela-Bela Spatial Development Framework, 2006).

<sup>10</sup> **Primary sector of the economy:** Involves the extraction and production of raw materials, such as corn, coal, wood and iron. (A coal miner and a fisherman would be workers in the primary sector.)

<sup>11</sup> **Secondary sector of the economy:** Involves the transformation of raw or intermediate materials into goods e.g. manufacturing steel into cars, or textiles into clothing. (A builder and a dressmaker would be workers in the secondary sector.)

Map 24: Settlement Pattern



# Waterberg District Environmental Management Framework Report

## 10.2. SETTLEMENT PATTERN

The settlement pattern in the district is fairly dispersed, with a high concentration of towns and villages in the east and the south (Mogalakwena, Bela-Bela and Thabazimbi municipalities), as indicated on Map 234 below. This development pattern is contributed to the following:

- Mining activities;
- corridor development along the N1 (Gauteng/Polokwane link), N11 (Mokopane / Botswana link) and (Bela-Bela/Thabazimbi link);
- topographical features (Waterberg range); and
- tribal land.

According to the Waterberg District Municipality SDF (2009, p59) the distribution of households according to land type is as follows:

Land Type	% Distribution
Farms	20
Formal Towns	39
Informal Settlements	2
Tribal Areas	39

This is indicative of a large rural development component.

Rural development is characterised by transformation from its natural state, which is contributed to the expansion of mining activities and the emergence of eco-estates and game lodges on farmland.

Densification associated with rapid economic growth is taking place in the following centres:

- Mokopane (Platinum mining);
- rural villages around Mokopane (population influx associated with mining);
- Lephalale (Coal mining and power generation);

- Thabazimbi (Iron mining and tourism); and
- Bela-Bela (Tourism).

Lephalale has attained the status of a growth node of national importance. It is identified as a Provincial Growth Point by the Spatial Rationale and is experiencing enormous growth in mining and the energy industries, with subsequent demand for services such as housing and infrastructure. Companies such as Eskom, Exxaro, Anglo Coal and Sasol have identified a number of development projects which will significantly change the development pattern of the region. In this instance the Lephalale SDF (2010) identifies the triangle between Lephalale, Stockpoort node and Steenbokpan as a node that will be spatially re-defined.

## 10.3. INFRASTRUCTURE

### 10.3.1. Roads

Road links are well established in the WDM area. The road network encompasses the whole hierarchy from national to provincial and local roads. The major linkages are the following:

N1: A north-east - south link running through the area. This link is of international importance and serves as an export link for especially mining products from Zambia and Zimbabwe. This route bypasses the main urban centres, but affected towns such as Mokopane, and Modimole and Bela-Bela do have access roads to the N1.

N1 – R33: A north – south link from Gauteng in the south to Lephalale in the north through Vaalwater. This link is significant as it carries transport associated with development around Lephalale.

R510: A north – south link from Rustenburg in the south to Lephalale in the north through Thabazimbi.

R516: An east – west link from Rustenburg to Polokwane through Bela-Bela. This is a main transport route for platinum ore from the Rustenburg area to the smelter in Polokwane.

Other routes are mainly district roads, most of which are unpaved and poorly maintained.

Whereas north-south linkages are well-established in the district, lateral linkages between the western and eastern parts of the WDM area are constrained by the mountainous core of the area.

With the exception of the N1, which is a toll road, the R-routes are not well-maintained and are deteriorating. Heavy vehicles transporting ore and construction material frequent these routes on a daily basis. Besides damage to the road surfaces, they also restrict the flow of traffic as these routes are mainly single-lane roads. This problem is exacerbated in mountain passes.

### 10.3.2. Proposed road development

There is a proposal to re-route the N11 to bypass Mokopane to alleviate the problem of congestion through town. Details around road building and surfacing projects could not be obtained.

### 10.3.3. Rail links

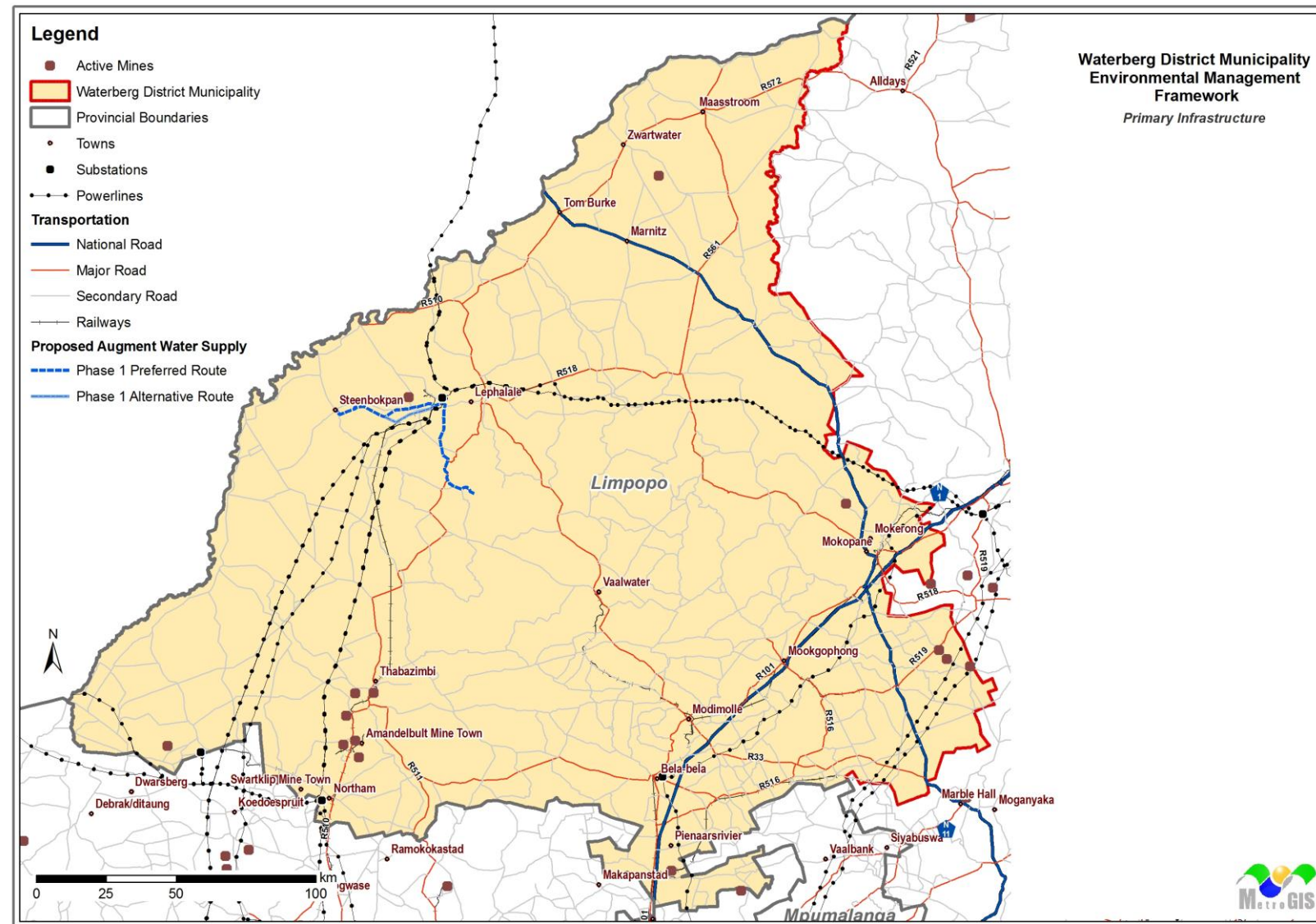
Rail links are associated with the major routes as described above. This means that only north-south rail linkages exist, as indicated on the map.

### 10.3.4. Airfields

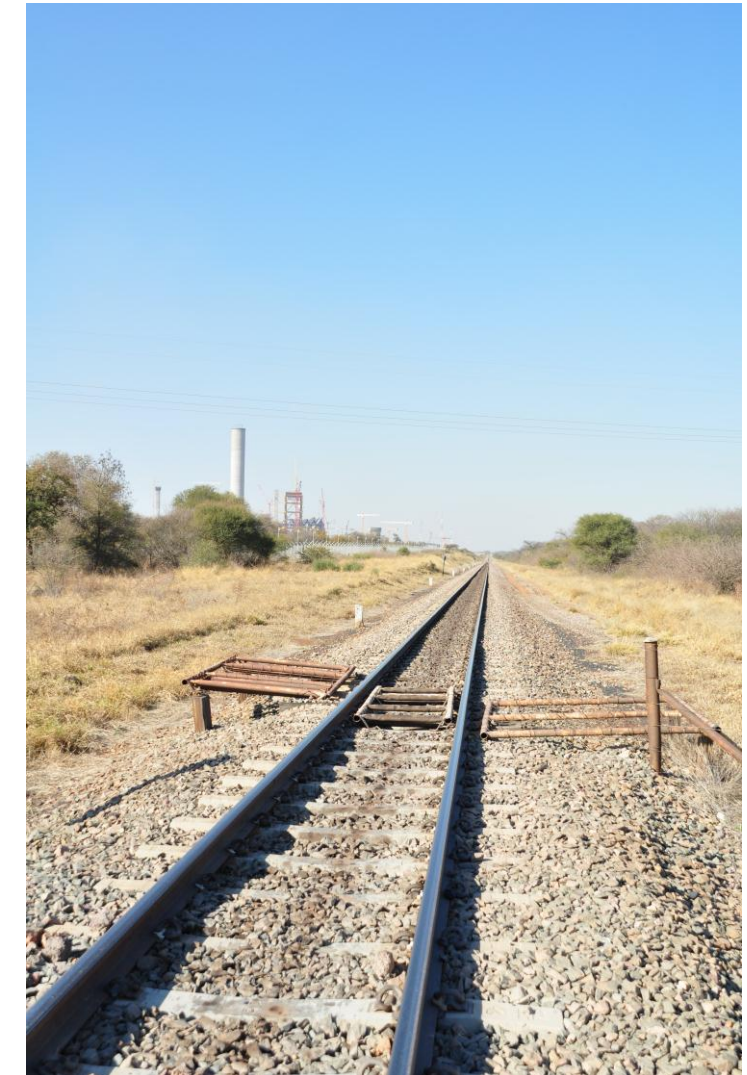
Major towns such as Thabazimbi, Lephalale, Bela-Bela, Modimole and Mokopane have airfields which accommodate light aircraft. At present no commercial flights exist. A number of private airfields occur in the Waterberg mountain area, which are mostly associated with the tourism industry, providing quick access to game lodges.

# Waterberg District Environmental Management Framework Report

Map 25: Primary Infrastructure



Railway near Medupi construction



Photos: S. Taljaardt

Poorly maintained road between Vaalwater and Lephalale



Photos: S. Taljaardt

Matimba Power Station



Photos: S. Taljaardt

Tourism information center – Mookgophong



Photos: S. Taljaardt

# Waterberg District Environmental Management Framework Report

## 10.3.5. Water Augmentation Project

The water augmentation project from the Lower Crocodile and the Mokolo dam was commissioned in order to combat the water insufficiency and the growing demands for water in the Waterberg area.

The project will be implemented in three phases. The first phase involves the construction of pipelines that will run parallel to an existing pipeline. This supplies the Lephalale municipal area with water from Mokolo dam until a transfer pipe from the Crocodile River can be implemented.

The second phase will involve the transfer scheme from the Crocodile River at Vlieeport near Thabazimbi to the Lephalale area.

The last phase will involve de-bottlenecking. This entails the construction of the first 9 km of the proposed gravity pipeline (for Phase 1) with interconnections to the existing pipeline (Exxaro pipeline).

## Mokolo Dam



Photo: Google Earth 2010

## 10.3.6. Integrated waste management plan

The Integrated Waste Management Plan (IWMP) for the Waterberg DM effectively reviews the status quo assessment of waste management and recommends measures to be implemented to set up an integrated waste management system. The major challenges to the implementation of effective waste management system are:

- Lack of capacity in municipalities;
- indigent households without the means to pay for services;
- waste collection service catering for urban areas;
- rural areas and resorts/farms not catered for;
- lack of capacity to monitor or implement the minimum waste management standards as outlined by DWA;
- no permitted landfill site in some areas (e.g. Lephalale);
- no waste management bylaws (need to development and implement);
- no consideration given for waste minimisation and recycling; and
- lack of waste information system.

No information on proposed landfill sites or any areas that may be affected as a result of waste management system. The IWMP did highlight the need for an environmental management system that should form part of a waste management system.

## 10.3.7. Integrated transport plan

As required by the National Land Transportation Transition Act 22 of 2000, each District Municipality is required to prepare an Integrated Transport Plan (ITP) which ought to include:

- Projects to be implemented in 5 years;
- include all modes and infrastructure;
- general strategy for travel demand management; and

- be synchronised with other planning initiatives, i.e. must be component of IDP and must be gazetted/approved by MEC.

The Provincial Roads traversing the WDM to be transferred to SANRAL.

There is as yet no Roads Master Plan for the WDM. The current practice for prioritising road projects are based on community requests and action by the Ward Councillors.

The Roads Agency Limpopo (RAL) is the custodian of all Provincial Roads in the Limpopo Province. The maintenance and upgrade of local roads thereof must be addressed in the Road Master Plan for the district. The Roads Master Plan addresses the maintenance and upgrade programme of roads.

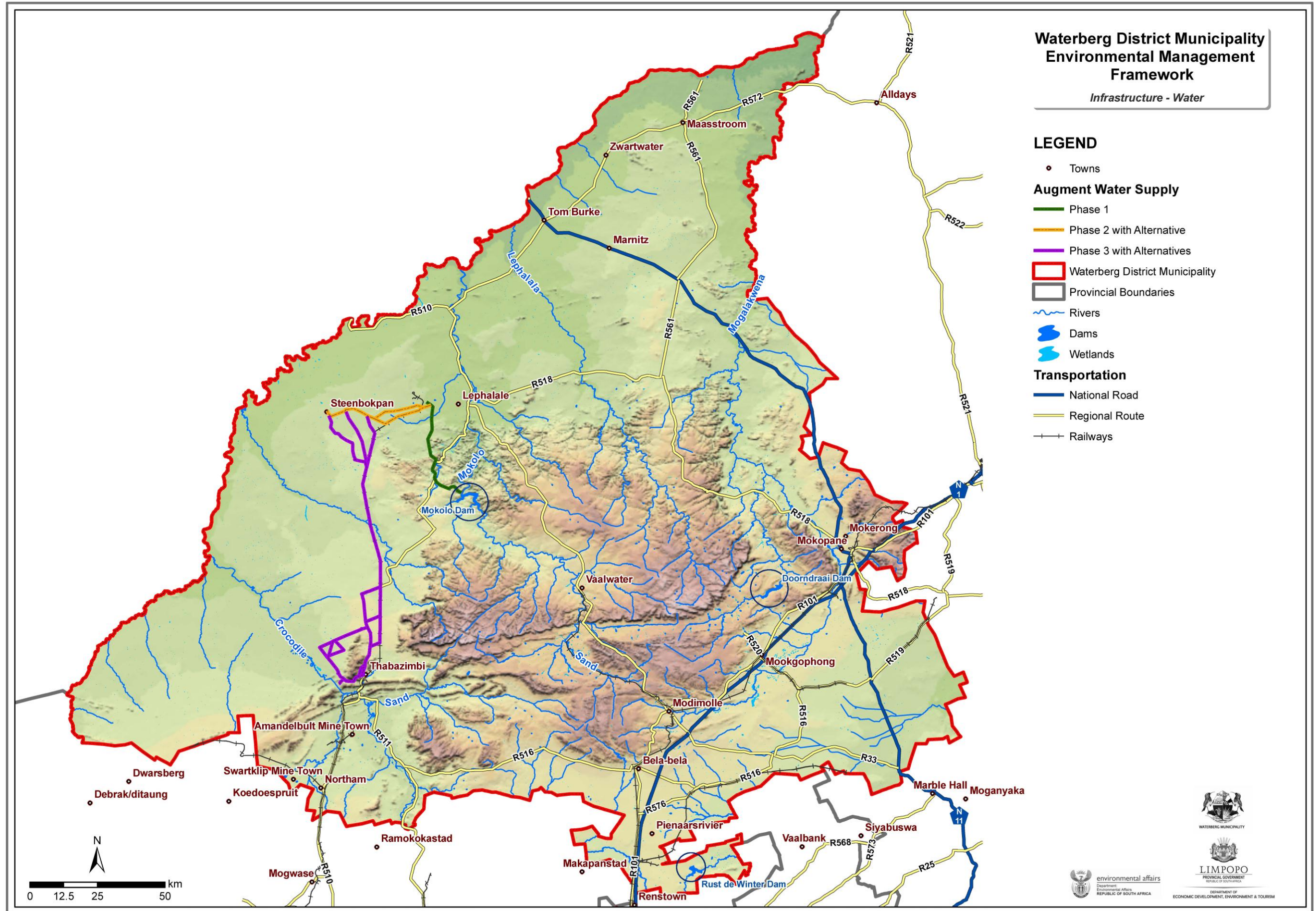
The maintenance and upgrade of local roads, Implementation Programme for ITP:

- Draw up Road Master Plan;
- road projects (N11 – Mpumalanga to Glogersburg) – budgeted for 2004-2009 cycle by WDM, SDM, CDM;
- set up road management system;
- prepare integrated land use and traffic models for major towns; and
- establishment of disaster management centre.

Several roads projects listed in the ITP (predominantly upgrade of access roads to towns), though these projects are for the 2004-2009 budget cycle. IDPs for local municipalities seem old. It is recommended that a list of projects be prepared in consultation with the WDM planning forum.

# Waterberg District Environmental Management Framework Report

Map 26: Infrastructure Water



# Waterberg District Environmental Management Framework Report

## 10.3.8. Engineering Services

All formal towns are serviced with basic infrastructure (water, electricity and sanitation). Most of the rural areas are dependant on boreholes for water and wood for energy, although the greater parts of these areas do not have access to basic sanitation services. Informal townships around major centers such as Mokopane are poorly serviced and the majority of households suffer access to basic services. It is expected that this situation will remain, or even worsen in future, as rapid expansion exceeds the rate of service provision.

There are plans to secure water provision through a bulks system from Lepele Water for the northern regions while Magalies Water plays an important role in the southern parts of the Waterberg District area.

Status of wastewater treatment systems in the Waterberg District Municipality

Reports in the media have highlighted the poor state of wastewater treatment facilities in South Africa. In response to this hazard, the Department of Water Affairs has undertaken an assessment of water service providers (WSPs) and waste water treatment works (WWTW) in different municipalities in the country. The methodology used in the Green Drop report (2009) employed assessing municipalities using a range of criteria comprising the following:

- The design capacity of plants;
- Flow amount exceeding, on, or below capacity;
- Number of non-compliance trends; and
- Compliance/non-compliance in terms of technical skills.

Modimolle Local Municipality was the only municipality in the Waterberg District to participate in the study. Modimolle Local Municipality scored 12% in the assessment. The other 5 municipalities did not participate in the study and were therefore allocated zero Green Drop scores.

## 10.4. SPATIAL PLANNING AND FUTURE DEVELOPMENT

The Spatial Development Framework for the WDM (2009) acknowledges the role of physical and natural features in “structuring the spatial manifestation of human development” (p.92).

Proposals for development are structured around existing form giving elements and include the following:

- Strengthen existing development nodes;
- Improve networks linking these nodes;
- promote development in the major economic sectors, i.e Conservation and Tourism, Mining, and Agriculture (including game farming); and
- strengthen rural development.

External linkages with the Capricorn District Municipality to the east, and Mpumalanga to the south are important to consider, especially with regard to conservation and agriculture.

### 10.4.1. Development initiative proposals

#### Branding<sup>12</sup>

Branding, and the need for a strategy for the Waterberg appears to be widely confirmed. It has been suggested that the brand not be confined to a single geographical area as the Waterberg District offers a variety of unique destinations and products. So as not to clutter the brand and confuse the market a common denominating brand applicable to all sectors is proposed. This brand could then be used across the entire district without creating competition between geographical areas or product categories.

#### Visual impacts in towns<sup>13</sup>

Visual clutter caused by haphazard, ill planned advertisement boards are a problem in many towns in the Waterberg District. This

visual clutter is often situated at the town’s entrance and gives a very poor first impression, especially from a tourism perspective.

The visual impact of the town entrances and streets are very important from a tourism perspective. Well planned streetscaping, maintenance of road verges, accentuating the entering and exit points of the town, and properly organised advertisements will improve the overall experience of the visitors.

Improved access and a pleasant environment along all main roads for vehicular and pedestrian movement will encourage visitors to spend more time in a town.

#### Tourism

Waterberg is already a major tourism destination. There are various initiatives including the Waterberg Meander. Map 27 Tourism depicts the approximate boundaries of the main tourism focus area as well as the routes that are important for tourism. Special care and maintenance of these routes is needed to avoid impact to the scenic quality and to enable such roads to serve as vantage infrastructure from which the scenic value can be appreciated.

#### Vaalwater town entry



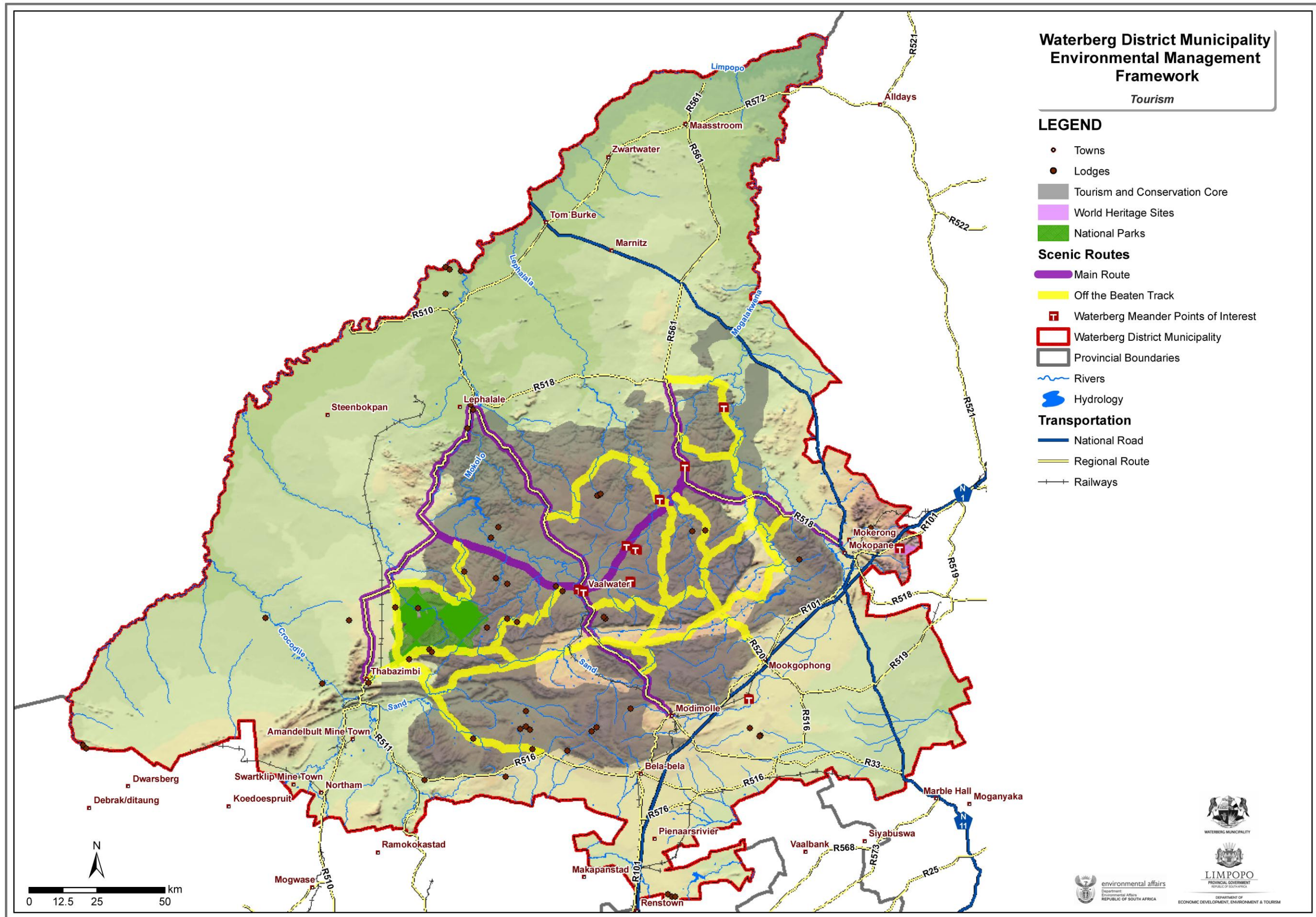
Photos: S. Taljaardt

<sup>12</sup> Main Source: Aurecon, (April 2010), *WDM Wildlife Study and Project Interventions*, Polokwane.

<sup>13</sup> Main Source: Aurecon, (April 2010), *WDM Wildlife Study and Project Interventions*, Polokwane.

# Waterberg District Environmental Management Framework Report

Map 27: Tourism



# Waterberg District Environmental Management Framework Report

## 11. BOTSWANA

Cross boarder impacts will occur in the Waterberg District, due to the vast coalfield that transverses the South African – Botswana border.

### 11.1. BOTSWANA COALFIELDS

Vast coalfields occur in the southern and eastern parts of Botswana. These include:

- The Pandamatenga Coalfield in the north east (runs across the border into the northern parts of the Hwange National Park in Zimbabwe);
- The Dukwe, Foley and Serule Coalfield that covers a vast area extending from the Tsholotsho area in Zimbabwe to an area underneath parts of the Makgadigadi Pans in a bow around Francistown to the Selebi Phikwe area to the north west of the Tuli Block;
- The Bobonong Coalfield (Limpopo Coalfield) that cover much of the central eastern tip of Botswana and runs across the border into South Africa (Musina area) and southern Zimbabwe;
- The Kgaswe, Moliabana Coalfield to the west of the Serowe and Mahalapye areas;
- The Mmamabula Coal Field that extends across the border into South Africa (the Waterberg Coalfield);
- The vast Dutlwe, Lethakeng Coalfield that lies from the Mpepu area in the east across half of the southern part of Botswana up to Dutlwe just south of the Central Kalahari Game Reserve; and
- The Ncojane Coalfield that stretches from Ncojane to just south of Babi-Babi in Namibia.

### 11.2. CURRENT BOTSWANA INITIATIVES

Although there are long term plans for the development of various coal fields in Botswana, the current focus is on the development of the Mmamabula Coalfield. It is known as the Mmamabula Energy Complex and consists of key projects namely:

- The establishment of a coal mine based on 1.9 billion tons of extractable coal of which approximately 14% is committed to the projects of the Mmamabula Energy Complex;
- A 2 400MW thermal power station of which 75% is intended as supply to Eskom and 25% for local demand in Botswana;
- A coal to hydrocarbons project based on an available resource of approximately 182 million tons which will produce synthesis gas which could be converted into petrochemical products such as dimethyl ether, gasoline and propylene; and
- A seaborne coal export project for the export of 432 million tons A-grade thermal coal via a new 1 500 kilometre Trans Kalahari railway line (a joint project between Botswana and Namibia) to either Walvis Bay or Luderitz in Namibia which will export an estimated 16 million tons of coal per annum (it has been mooted that this railway line could also be linked to Lephalale and make bidirectional transport of coal possible<sup>14</sup>).

The timing and rate of development of the above projects are dependent on the finalisation of the agreements between Botswana and South Africa to purchase electricity from the Mmamabula Energy Complex.

The development of a smaller 300MW domestic power project at Mmamabula is also being investigated.

It is anticipated that the above projects will serve as catalysts for the further development of not only the Mmamabula Coalfield, but

also other coal resources and specifically the Dutwe, Lethakeng Coalfield (focussing on A-grade thermal coal exports to China and other countries in the east).

### Position of Mmamabula



<sup>14</sup> Personal discussion with CIC representatives at stakeholder meetings.

**SECTION B: STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN, INCLUDING:**

- **Key Issues**
- **Desired State**
- **Sensitivity Analysis**
- **Environmental Management Zones**
- **Guidelines**

# Waterberg District Environmental Management Framework Report

## 1. INTRODUCTION

### 1.1. PURPOSE

The future desired state of the environment must be based on what people across sectors and interests collectively believe can and should be achieved in the area, as well as what is possible and necessary in respect to the use of resources to move from a currently unsustainable development to sustainable development of the area in the long term. In this respect the spatial context, time perspective, needs and expectations of different groups and sectors as well as the sensitivity of the environment needs to be considered.

This part of the report includes the following sections:

- A distillation of key issues.
- A summary of the desired state of the environment as expressed by stakeholders and the public (submitted responses are included in Appendix 1).
- A sensitivity (priority) analysis of environmental factors.
- Environmental management zones including:
  - A description of each zone;
  - Proposed desired state of the environment for each zone; and
  - Identified preferred, compatible and undesirable activities for each zone.
- Environmental management guidelines for key aspects.

### 1.2. SPATIAL CONTEXT

The Waterberg District is a vast area with distinct areas of high and low population, rich and poor mineral wealth, relative high to very low rainfall, good to poor access to markets, vast natural areas to derelict degraded, spectacular landscape features to boring monotony etc. This context necessitates an approach that can maximise opportunities and minimise constraints for both

conservation and development in a manner that will over time (30 to 50 years) result in an environment where sustainable development can start to become a reality instead of remaining an objective.

### 1.3. TIME PERSPECTIVE

From the Status Quo Report it is clear that the Waterberg District has a specific set of assets which can shape the future of the district. Some of these assets will require consumptive utilisation of natural assets to generate income over time and will eventually, in the long term, become depleted. In order to ensure that the economy and environment of the district does not collapse in the long term it will therefore be necessary to increasingly invest in non-consumptive use of natural resources to gradually replace activities that consume and deplete natural resources.

### 1.4. SECTORS

The key sectors in the Waterberg District include:

- Mining which currently accounts for more than 50% of the income of the district.
- Agriculture which is by far the largest employment sector in the district, despite its relatively low income.
- Game and cattle farming which occupies more land than any other sector in the district.
- Tourism, especially nature based tourism which is the fastest growing sector in the district with significant additional potential.
- Conservation of habitat, threatened species, unique landscapes and a rich cultural heritage.

### 1.5. SUSTAINABLE DEVELOPMENT CONTEXT

There are many definitions of sustainable development which may apply to a greater or lesser extent to the district. What is however important in this particular instance is that it should be focussed on

all of the following, failing which the concept itself will in all likelihood not be sustainable in the district:

- It must ensure the adequate and appropriate protection of biodiversity in the district.
- It must ensure that the surface water resource in the area is managed in a manner that will ensure that it continues to provide in the needs of the area and that the water that is returned to the system is of an acceptable quality.
- It must ensure that the quantity and quality of the groundwater in the area is protected and kept at a level and quality where it can continue to sustain the activities that depend on it, especially rural communities
- It must ensure a continued and even increased income for the district and especially its poor communities.
- It must provide for increased levels of employment and better types of employment.
- It must provide incentives for the establishment of a more balanced population structure especially in respect to the age, health and general prosperity of the population.

### Agriculture in the Waterberg District



Photos: S. Taljaardt

# Waterberg District Environmental Management Framework Report

## 2. KEY ISSUES

The key issues for this project were identified in three stages. In the first stage, key issues were identified by the project team, before the public participation process began. In the second stage, issues that arose during the first round of public participation were identified and included in the Public Participation Report (appendix to the Draft Status Quo Report). During the third stage, additional and persistent issues that arose during the second round of public participation were identified.

A summary of the key issues that were identified up to this point in the project is presented below.

### 2.1. WATER AVAILABILITY AND UTILISATION

The following key issues were raised:

- The relative scarcity of water in the Waterberg District is recognised by all sectors and groups in the district (throughout all phases).
- The protection of important water catchment areas from activities (dams, weirs, road/track/path crossings, removal indigenous vegetation, etc) that may have a negative impact on water production and runoff, and in particular the upper parts of river systems, is a major concern (throughout all phases, but particularly in the second round of the public participation process).
- The need to determine and maintain ecological reserves for all the rivers in the area should be addressed as a matter of urgency (raised during the first and second rounds of the public participation process).
- The extensive occurrence of alien vegetation along certain waterways impacts negatively on water production and runoff (raised during the first round of the public participation process).

- Illegal dams and water extraction impacts negatively on water production and runoff (raised during the first round of the public participation process).

### 2.2. WATER QUALITY AND POLLUTION

The following key issues were raised:

- Water pollution was identified as one of the major issues in the district (during all phases). Causes of water pollution include:
  - Failing of municipal sewage works (biggest concern);
  - Lack of proper sewage systems and management at lodges and tourism facilities on farms and game reserves in the area;
  - Other sources mentioned include agricultural pesticides and fertilisers as well as polluted water runoff from industries and mines.
- The quality of water for human consumption is an issue in especially the rural settlements as well as some of the small towns (during all phases).

### 2.3. AIR QUALITY

The following key issues were raised:

- Potential significant negative changes in the air quality of the district and the Lephalale area in particular, is likely to occur in future due to the development of the Lephalale Coal Field (LCF) (remained an issues through all phases).
- Current air pollution sources of concern are:
  - Dust from mines, quarries, brickworks, spoil/overburden heaps and heavy vehicles using gravel roads.
  - The burning of solid waste at waste disposal sites, informal waste dumps and especially on farms and at tourism facilities in natural areas.

- Smoke from vehicles especially heavy vehicles that drive through towns.
- The adoption of ambient air quality standards for specific areas of the Waterberg District is regarded as a priority (second round of the public participation process).

### 2.4. NOISE

The high noise level caused by heavy vehicles through towns where the roads (surface and movement patterns) are not designed for such traffic is a major issue, especially at night.

### 2.5. CHARACTER OF THE WATERBERG DISTRICT

The following key issues were raised:

- The visual impact of the power stations and other large scale developments such as mines in the area is significant and imprints an industrial element onto the bushveld character of the area.
- The sudden, rapid, poorly planned (at least the perception) expansion of the Lephalale urban area resembles a typical “boom town” with all its uncertainties and inability to maintain the old values and expectations of residents (remained an issue throughout the process).
- The Waterberg (not the district as a whole) is gradually loosing its wilderness character as a destination, as more and more enterprises and individuals focus on individual marketing and branding instead of promoting the Waterberg as one nature/wilderness destination (an issue in both rounds of the public participation process).
- Certain types of development in the Waterberg such as lifestyle and golf estates are damaging the wilderness character of the greater area in return for localised individual benefits (an issue in both rounds of the public participation process).
- Random and seemingly unplanned advertisement and ad hoc retail activities in towns, especially along the main

# Waterberg District Environmental Management Framework Report

roads, is damaging to the character of the area (second round of the public participation process).

## 2.6. WATERBERG BIOSPHERE RESERVE

- The Biosphere Reserve concept is generally supported.
- The public at large is uncertain in respect to the meaning and implementation of the biosphere reserve concept. The roles of government and the private sectors are unclear (issue raised during the first round of the public participation process).
- The reasons for the current boundaries of the Waterberg Biosphere Reserve are not clear. Core areas seem to be determined by currently conserved (private and public) areas while many important sensitive areas are not included (issue raised during the second round of the public participation process).
- There is an opinion that the Waterberg Biosphere Reserve, especially the core area, has a fragmented layout and that it should be consolidated into one continuous area (issue raised during the second round of the public participation process).
- The possible expansion of the Waterberg Biosphere Reserve boundaries to incorporate more sensitive areas as well as areas with high nature orientated tourism potential was also suggested (raised during the second round of the public participation process).
- It was suggested that the Waterberg Biosphere Reserve should be managed according to an Environmental Management Plan, with clear boundaries, zonation and guidelines on acceptable activities (raised during the second round of the public participation process).

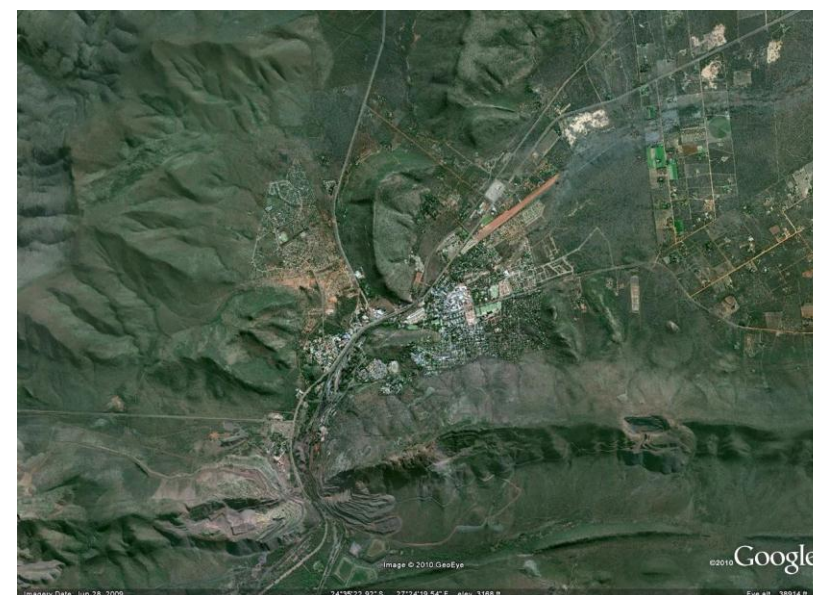
## 2.7. FIREWOOD

- The collection of firewood from natural vegetation is causing significant damage in certain areas (raised during the second round of the public participation process).

## 2.8. CHANGE TO THE POPULATION STRUCTURE AND SOCIO-ECONOMIC CONDITIONS

- The change to the population structure and socio-economic conditions, across the area and working both ways, is significant and results in major adjustments that people have to get used to in their daily lives (an issue through all phases).
- Towns and Lephalale in particular has difficulty in dealing with the sudden influx of people into the area. The infrastructure is under pressure, especially in respect to waste disposal, sewage, housing, electricity and water supply (an issue in both rounds of the public participation process).
- The number of people flocking into the Lephalale area exceeds the number of available jobs. This leads to severe poverty and increased crime rates (raised during both rounds of the public participation process).
- The use of imported labour, “because the local population is unskilled” is a significant cause of tension in the area (raised during both rounds of public participation process).

### Thabazimbi



Photos: Google Earth 2010

## 2.9. SERVICE INFRASTRUCTURE NEEDS

Service infrastructure needs came out as the most pertinent issue during both phases of the public participation process. The issues include:

### 2.9.1. Roads

- The general condition of roads in the district is very poor. In many places the deterioration of the roads has progressed to such an extent that the roads are hazardous to use. Coupled to high volumes of heavy vehicles on the main roads it has now become a matter of “life and death” on certain roads.
- The poor conditions of the roads have major negative effects for especially the tourism (difficult to transport visitors safely and efficiently) and agriculture (difficult to get goods to markets in an acceptable state) sectors but also for other economic sectors.
- The poor maintenance of road shoulders, means that roads no longer serve as fire breaks which places crops and grazing across the district at risk.

### 2.9.2. Telecommunications

- Telecommunication is generally very poor in the Waterberg District. The existing infrastructure is overloaded and unreliable.
- Unreliable telecommunication impacts negatively on services such as banking, and internet communication.
- Bookings cannot be made from local tourism facilities, which means that booking agents in Gauteng are used by most operators in the tourism and hunting industries.

### 2.9.3. Electricity

- The electricity supply to certain areas of the Waterberg District is unreliable and power outages often occur.

# Waterberg District Environmental Management Framework Report

## 2.9.4. Water and sewage

- The almost complete failure of sewage works in much of the area and the subsequent pollution of rivers and wetlands is a major concern for many.
- The provision of potable water to communities, especially rural communities is of concern especially in the light that ground water levels seem to be declining in many places.

## 2.9.5. Education and skills training

- The low level of education in the Waterberg District is a far reaching issue which hampers the development of the entire population of the area.
- The quality of education offered is considered to be well below standard. This impact on the ability of school leavers to integrate more readily into urban areas, or attend tertiary education facilities.
- The need for skills training in the Waterberg District has been emphasised by several participants. Many of the local people are not considered for employment opportunities in the area, as they are considered unskilled.

## 2.9.6. Waste disposal

- Very few proper solid waste disposal sites exist in the Waterberg District. This makes disposing of waste legally very expensive, as it is necessary to transport it over a distance. There is no provision for hazardous waste which is transported to a facility in Gauteng.
- Most farms, lodges and tourism facilities have their own waste sites. These are often mismanaged and the burning of waste is a common occurrence.
- A strong desire for recycling to become the preferred destination for waste in the Waterberg District was expressed by various participants.

## 2.10. GOVERNMENT

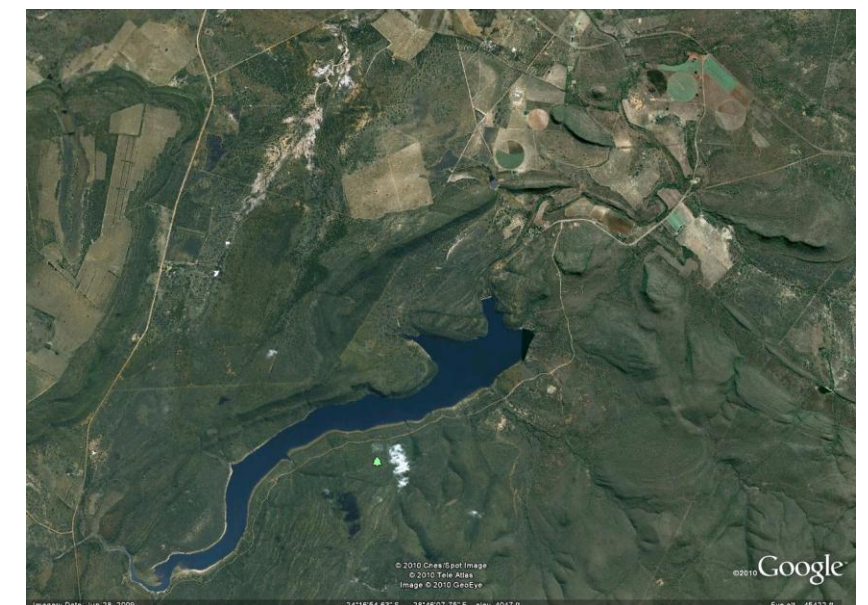
- Better co-operation between the various government departments is needed (raised during both rounds of the public participation process).
- A long-term perspective and vision from government for the district is needed (raised during both rounds of the public participation process).
- Government procedures and regulations are too time consuming and difficult to follow (raised during both rounds of the public participation process).
- Government officials often display indifference to the public (raised during both rounds of the public participation process).
- There is a desperate need for more, better and faster implementation, monitoring and enforcement from government. No more regulation (raised during both rounds of the public participation process).
- Decisions should be made, based on what is best for the people and the area concerned. There is too much political interference in decision-making (raised during both rounds of the public participation process).
- The government must take responsibility for and act on the results of the EMF (raised during both rounds of the public participation process).

## 2.11. PLANNING AND DEVELOPMENT

- The development of suitable transport infrastructure, especially for the bulk transport of coal and ore, whether by road or rail, is a burning issue that should be addressed as a very high priority (raised during both rounds of the public participation process).
- Certain key roads should be upgraded in order to unlock the tourism potential of the area (raised in the first round of the public participation process).

- The possibility of further large dams in the area should be investigated as an alternative to importing water from other catchments (raised during the second round of the public participation process).
- The suggestion of infrastructure corridors was met with a positive reaction from all participants. However, technical issues should also be taken into account to ensure that needs could be met and that the corridors themselves do not sterilise minerals or productive land (raised during the second round of the public participation process).
- The uncertainty of the future of the area, especially in respect to mooted large scale development projects, is resulting in major socio-economic impacts (e.g. abnormally inflated land prices) and a general paralysis of decision-makers in government and in the private sector - everybody seems to be waiting for everybody else to make decisions first. There is a need for a clear and transparent plan for the area that spells out what will happen and when (a key issue raised during both rounds of the public participation process).

## Doordraai Dam



Photos: Google Earth 2010

# Waterberg District Environmental Management Framework Report

## 3. THE DESIRED STATE

### 3.1. INTRODUCTION

This section illustrates what is important to the different sectors as conveyed by participants in the stakeholder and the public participation process. It is not always in line with what is generally expected and the focus of the desires expressed also often reflects needs and expectations of participants, rather than what people collectively would suggest the desired state should be. It is nonetheless important as it clearly shows that any future desired state must take the needs and expectations of people into account in order to be realistic and feasible.

### 3.2. ACROSS ALL SECTORS

All the sectors expressed a need for improvement in service infrastructure. It is also generally expected that these improvements should be government's contribution to the economic development of the area over the short term.

Infrastructure improvements required are:

- The upgrade of roads to levels that is appropriate to the traffic that uses them.
- The upgrade of the rail network to fulfil the bulk transportation needs of the mining and industrial sector and to take as much bulk transportation off the roads as possible.
- The securing and provision of water for the development of the area including mining, electricity generation municipal needs and farming allocations.
- The upgrade and proper management of sewage treatment works of municipalities to enable them to comply with the relevant standards.
- The improvement of the capacity and quality of the telecommunication network in the area, especially in respect to businesses such as banks.

- The establishment of a more reliable electricity network that is less prone to regular outages (caused by lightning etc.).

### 3.3. GAME FARMING

The game farming community is being represented by various sub-groups whose activities are dictated by the specific "markets" they operate in. These sub-groups include:

- "Weekend farmers" who represent individuals, groups or organisations that own farms with game, primarily for their own recreation and enjoyment. Hunting is often a secondary activity and is mostly focussed on meat for own use.
- Residential farmers who represent persons who stay on farms on which they keep game, often in conjunction with cattle. Hunting is mostly for stock control and own use.
- Private "conservation areas" where the focus is on commercial tourism in natural environments. In these areas the focus of hunting is mostly on the management of game stock.
- Trophy hunting areas where the focus is on providing high quality hunting stock with upmarket facilities to cater for the discerning needs of high end customers.
- Game breeders where the focus of the activities is on the breeding and raising of game stock for re-sell.
- Any combination of the above.

Due to the strict regulations that are applied many (not all) game farmers are of the opinion that they are unfairly discriminated on by government, which makes their industry unnecessarily difficult and expensive to the extent where it is becoming difficult to operate. They operate and want to be seen to operate as farmers who provide a certain product to the market and not as conservation agencies that generate a by-product. Conservation of land is a secondary benefit that is derived because game farmers have to manage their farms properly to ensure sustainable businesses.

There is therefore a need for a change in the regulations that are used to manage the industry in order to also meet the "commercial farming" needs of game farmers, while maintaining only the necessary controls.

There is a need to establish a unique brand for South African Game meat and the expansion and promotion of game meat as a high quality product that can become a profitable and sustainable industry in the Waterberg District.

### 3.4. TOURISM

The tourism industry in the Waterberg District has a rich offering of landscape, biological and cultural features with a potential to develop a high quality tourism product for a variety of markets. It is also very favourably located in relation to Gauteng which makes it an ideal area for weekend and short holiday breakaways.

Tourism destinations and activities in the Waterberg District include:

- Lodges in nature reserves.
- Hot springs with spas.
- Recreation lodges/hotels with recreational facilities.
- Sectional title ownership on conservation farms.
- Scenic routes.
- Cultural villages and traditional hospitality venues.
- An abundance and variety of landscape, biological, cultural features and areas.

There is a need for a strong "Waterberg brand", supported by government that promotes the area as a whole, as a destination. This should include a strategy, guidelines and implementation plans to improve the image of the towns in area to the extent that they can also fit in and benefit from the "Waterberg brand".

Although tourism is already an important sector in the Waterberg District, there is a need for a long term strategy to build the full potential of the tourism product over time to become a key driver in

# Waterberg District Environmental Management Framework Report

the economy of the area, in respect to both income and employment generation.

The maintenance and preservation, including labelling and descriptions of historic building, artefacts and cultural historic features should be better funded and supported by government.

An education programme should be developed and implemented for the people in the district to make them aware of the importance of tourism in the area and how they can contribute to make it a success. This should also include the training of guides.

## 3.5. CONSERVATION

### 3.5.1. General

Conservation areas in the Waterberg District includes:

- A national park;
- Provincial reserves;
- Private conservation areas (some of them quite large);
- A world heritage site; and
- A Ramsar site.

Much of the current attention in respect to conservation expansion seems to be focussed on the Waterberg Biosphere Reserve and the expansion thereof onto private property.

There is very little public investment into the expansion of conservation areas, and the focus of the conservation authorities is therefore on the strict management of development and change on private land which could impact negatively on the natural environment, whether such properties fall within or outside conservation areas. Education of landowners and reliance on conservation of private land is, however not enough. This approach is at least partly to blame for the currently strained relationship between conservation authorities and certain game farmers.

There is a clear need for much higher levels of public investment into conservation in the area over the medium term (up to 30 years

from now). Sources for such capital injection may range from allocations from the Global Environmental Facility to compensative investments from large development projects in the area.

Certain conservation NGO's also proposed a much more hard-line "sustainable development" approach to conservation that should restrict and even stop further development of the area in total in order to achieve a truly sustainable state (for biodiversity) in the area. The political and practical implications of this suggestion are however, obvious.

### Nylsvley

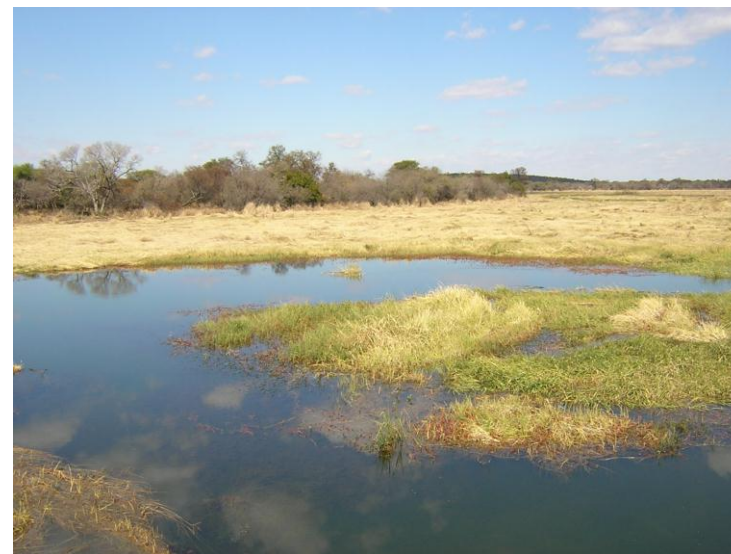


Photo: S. Taljaardt

### 3.5.2. Waterberg Biosphere Reserve

The Waterberg Biosphere Reserve concept has been developed over many years and is in several respects the model for this form of conservation in South Africa. It is generally accepted and also supported by the sectors in the Waterberg District.

There is a need to support and develop the Biosphere Reserve further. The current mismatch between important ecological and landscape areas in relation to the different zones of the Biosphere Reserve needs to be addressed.

An Environmental Management Plan to manage the Waterberg Biosphere Reserve has been proposed and it was suggested that it be linked to much stricter compliance monitoring and enforcement. Landowners should also be educated in respect to

the implementation and advantages of the Environmental Management Plan.

The Biosphere Reserve should be promoted as a core eco-tourism element in the wider Waterberg area.

## 3.6. AGRICULTURE

Agriculture in the area is important for the production of food for the expanding markets in parts of the district and also for markets in nearby Gauteng. In addition, agriculture remains the most important employment sector in the district and as such has an important function in the stability of the social structure of the area. For these reasons it is important that current agricultural practices, especially intensive agriculture be maintained and be expanded onto additional high potential agricultural land in future.

## 3.7. MINING AND INDUSTRY

Mining is the cornerstone of the economy of the district and currently accounts for more than 50% of the GDP of the area. It is highly unlikely that this contribution will decrease over the next 60 to 100 years. The mining industry is therefore important for the development of the district over the medium to long term. The mining and industry sectors desire to see skills development and training programmes implemented.

There is a need for better coordinated government, especially in respect to permitting (including licensing authorisations etc.). The processes should also be more efficient and integrated to avoid long waiting periods.

There is a desperate need for clarity on what government's long term plans are in respect to the further development of the Waterberg Coal Field, especially in relation to electricity generation and potential liquid from coal processes. Commitments from government to supply adequate water, transport infrastructure and other necessary infrastructure is also required to reduce the risks of private enterprise and to make proper planning possible.

# Waterberg District Environmental Management Framework Report

## 4. SENSITIVITY ANALYSIS

### 4.1. INTRODUCTION

The sensitivity analysis together with the structural spatial elements (towns, villages, mineral resources, economic activities, etc.) identified in the status quo stages and the desired state as expressed in the previous section of this report, provides the basis for the development of Environmental Management Zones (next section of the report).

Based on the findings contained in the draft Desired State Report it was decided to do further analysis on the following aspects in order to refine a spatial base that would be relevant and accurate for the identification of Environmental Management Zones:

- General environmental sensitivity (ecological and landscape);
- Conservation planning (current protected areas and potential expansion areas);
- Water production priority areas; and
- Agricultural intensity (footprint).

### 4.2. GENERAL ENVIRONMENTAL SENSITIVITY (ECOLOGICAL AND LANDSCAPE)

The purpose of determining the environmental sensitivity is to delineate the boundaries of areas that are important from a biodiversity and landscape conservation perspective. Based on the draft Status Quo Report the following elements were considered “sensitive” in this assessment:

- The occurrence of vegetation types of conservation importance (i.e. vegetation types that are well represented in conservation areas have a low conservation status, while those that have been reduced by transformation and have a low representation in conservation areas will have a high conservation value);
- Occurrence of threatened species;

- Centres of endemism;
- Existing protected areas (including the Waterberg Biosphere Reserve);
- Occurrence of perennial and non-perennial rivers and streams including a 32m buffer on each side of the rivers or streams;
- Sensitive or high value (aesthetic) landscapes including escarpments, high mountains and hills, mountains and hills, parallel hills, enclosed plains, undulating plains, incised river valleys and hills as well as terraces;

This sensitivity is indicated on Map 28: Environmental Sensitivity Index, and reflects the relative sensitivity of the different areas in the district.

### 4.3. CONSERVATION PLANNING PRIORITIES

The purpose of including a data layer depicting current conservation planning, Map 29: Protected Areas and Conservation Planning Priorities, is to make a comparison between what is being conserved or being planned to be conserved in terms of current plans and the environmental sensitivity discussed under the previous point. Areas that were considered include:

- National and provincial parks and reserves;
- Municipal conservation areas;
- Private nature reserves;
- The Biosphere Reserve (current boundaries) including the core, buffer and transition areas; and
- Areas included in the National Park Expansion Strategy including priority areas and buffer areas.

Map 30: Protected Areas and Environmental Sensitivity Index indicates the current relationship between environmental sensitivity and protected areas.

### 4.4. WATER PRODUCTION PRIORITY AREAS

Given the relatively low rainfall in the area but the unique localised catchments formed by the Waterberg Mountain, it was also necessary to consider the water production priority areas as depicted in Map 32: Water Production Priority Areas, as a key element for determining Environmental Management Zones. This is especially important as much of the current development and proposed development in Lephalale depends on water generated in the Mokolo River Catchment, at least in the short term.

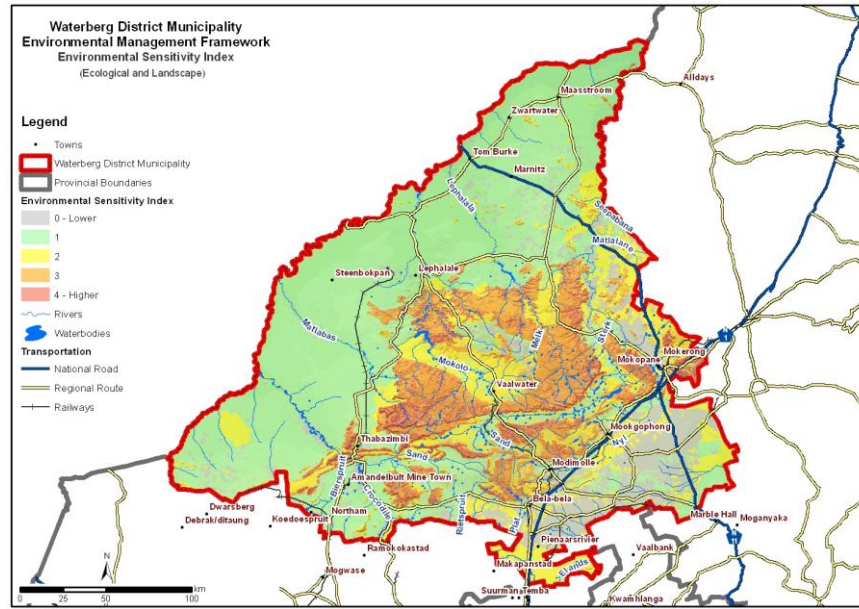
### 4.5. LAND CAPABILITY FOR AGRICULTURE

Agriculture is an important sector in the district that is dependent on natural resources (soils and water). It also makes a significant contribution to the rural character of the district and in places it forms a visual and physical link between sensitive natural areas. It is therefore a strong form-giving element that contributes significantly to the sense of place in certain areas and therefore had to be considered in the delineation of the Environmental Management Zones. The intensity of agriculture, as depicted on Map 31: Agricultural Intensity Index, was used to identify core agricultural areas (hubs).

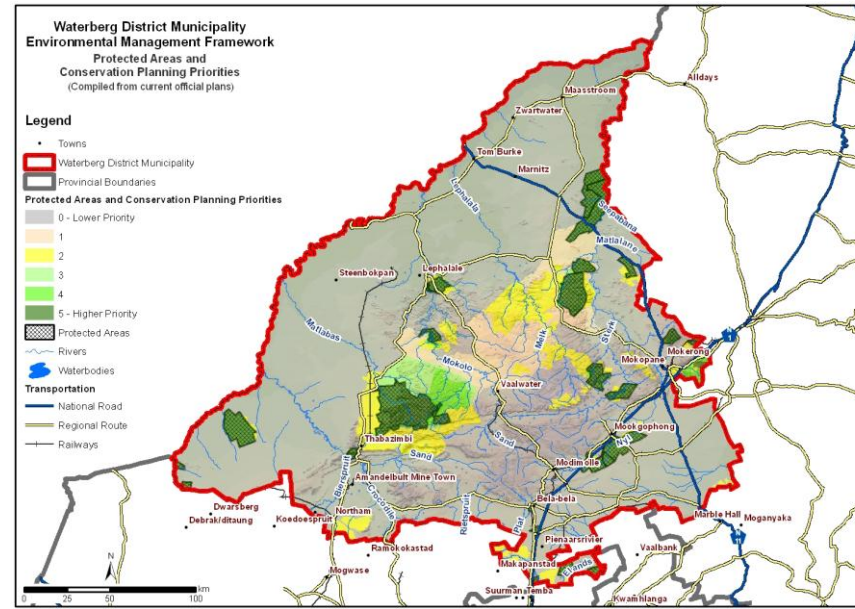
Grazing areas have not been considered as it represents the default activity (what is left) in the district.

# Waterberg District Environmental Management Framework Report

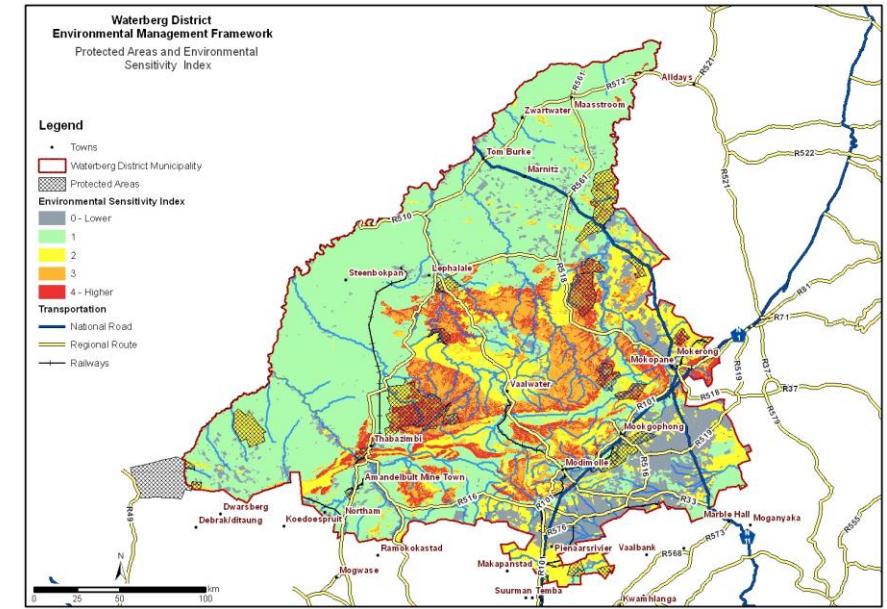
**Map 28: Environmental Sensitivity Index**



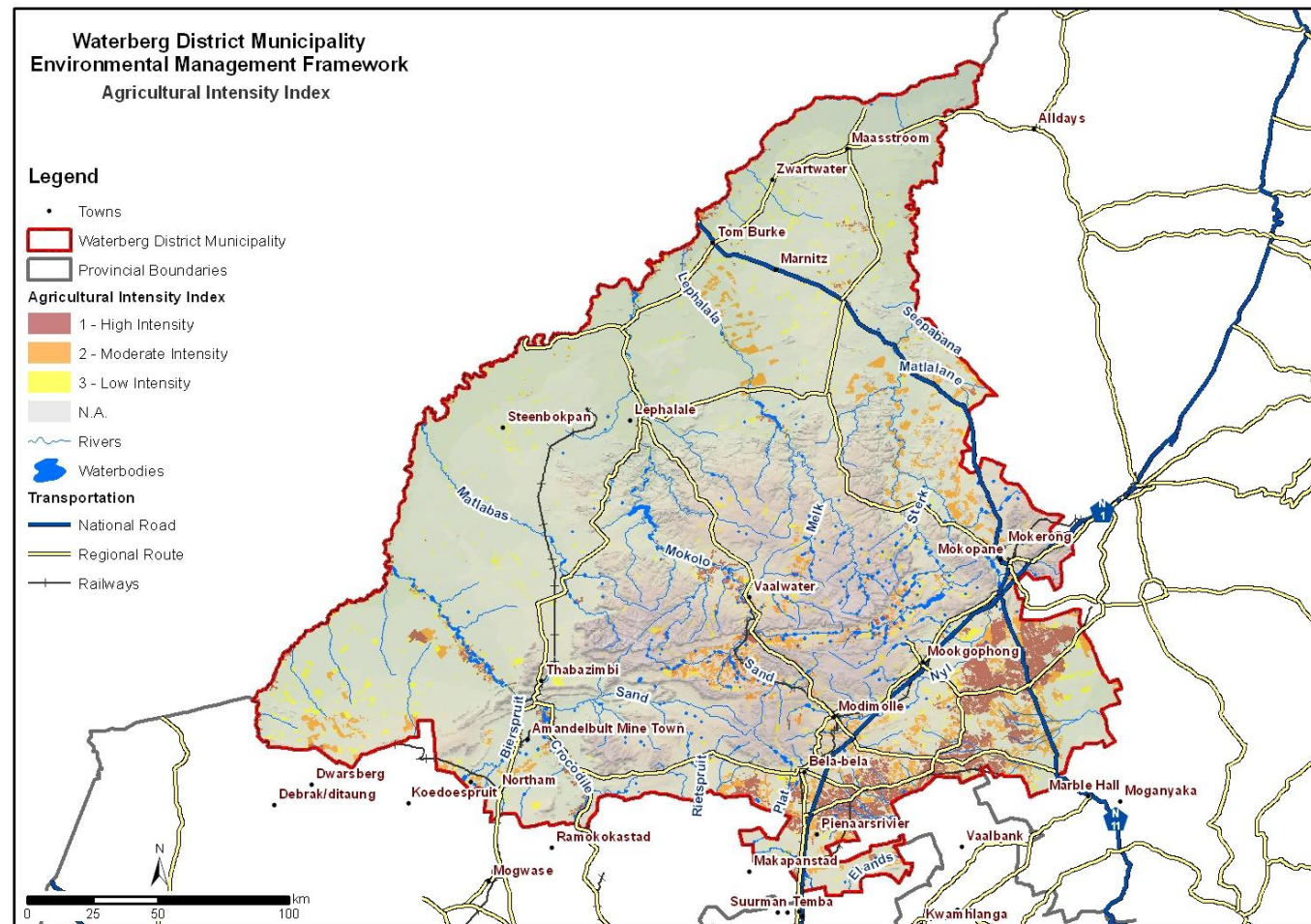
**Map 29: Protected Areas and Conservation Planning**



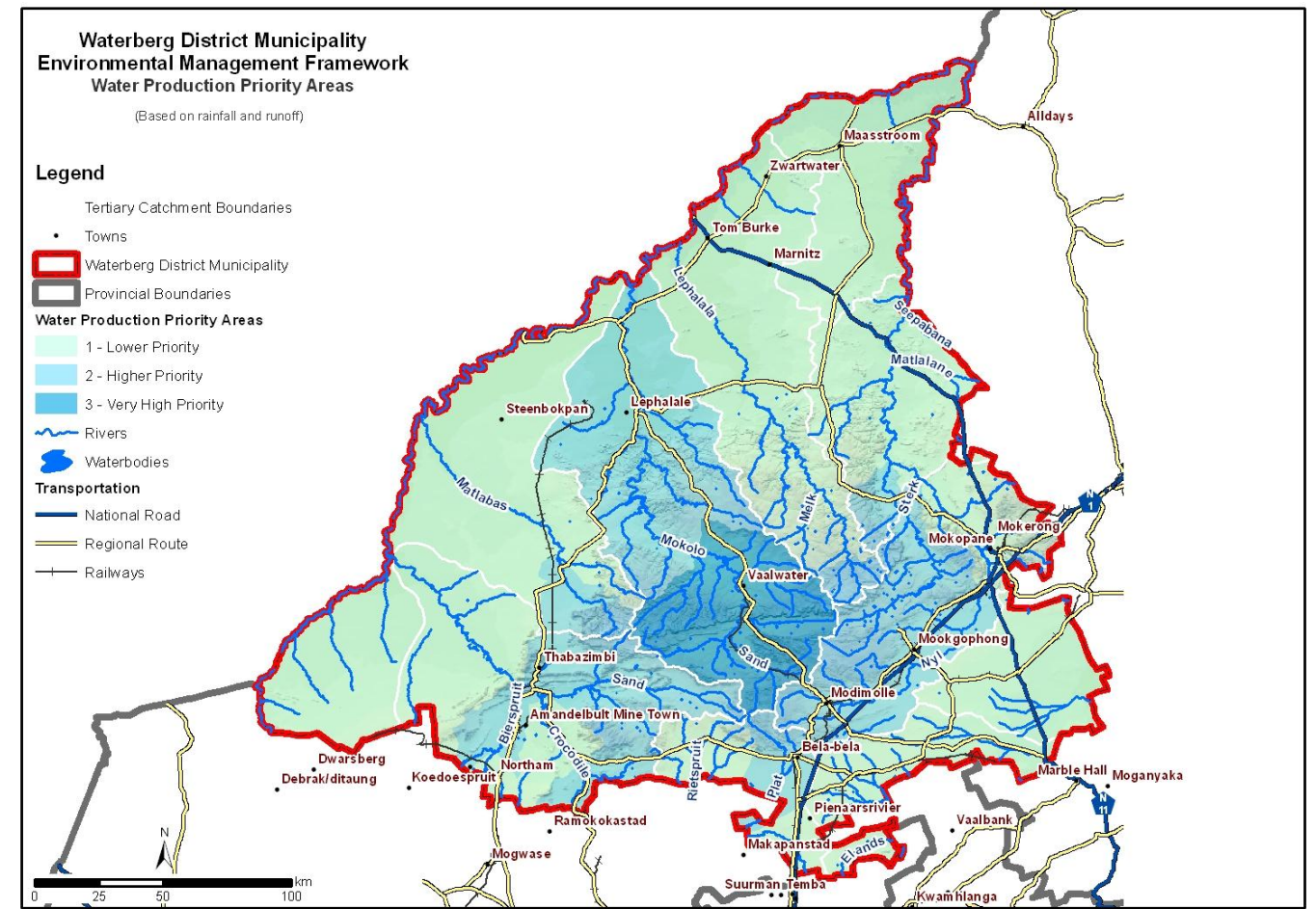
**Map 30: Protected Areas and Sensitivity Index**



**Map 31: Agricultural Intensity Index**



**Map 32: Water Production Priority Areas**



# Waterberg District Environmental Management Framework Report

## 5. ENVIRONMENTAL MANAGEMENT ZONES

### 5.1. INTRODUCTION

Initially the Environmental Management Zones for the Waterberg District EMF were determined through the careful evaluation of the status quo inputs and especially the environmental sensitivity and other priority needs in the area as described in the previous section of the report.

These Environmental Management Zones for the Waterberg have been revised and refined based on the following:

- Feedback from stakeholders and interested & affected parties on the Draft Desired State Report;
- feedback and inputs received during a workshop with municipal authorities (workshop of 19 and 20 August 2010,
- feedback and inputs received during a workshop with national and provincial authorities (workshop of 26 August 2010);
- feedback and inputs received from stakeholders and interested & affected parties on the draft Environmental management Zones (comment period closed on 23 August 2010); and
- a more in depth assessment of the wider regional context, including likely activities within Botswana.

The section provides a short description of each EMZ, a description of the desired state of each EMZ (taken from the Desired State Report) as well as an indication of preferred activities, compatible activities and undesired activities (as required in the EMF Regulations, 2010). **It does not however mean that undesired activities for example will not be allowed under any circumstances but rather that such activities will have to meet very high standards and be considered very carefully by the relevant competent authorities before they are allowed.**

The following Environmental Management Zones have been identified and are delineated on Map 33: Environmental Management Zones:

- Zone 1: Protection of natural vegetation, scenic landscape and rock painting areas, with limited appropriate tourism;
- Zone 2: Nature and cultural tourism focus areas within a high quality natural setting;
- Zone 3: Game and cattle farming (including hunting) areas with commercial focus;
- Zone 4: Mining focus areas;
- Zone 5: Potential large industrial and related activities focus area;
- Zone 6: Restricted mining focus areas in aesthetic and/or ecological resource areas;
- Zone 7: Urbanisation focus areas and nodes;
- Zone 8: Rural settlement areas;
- Zone 9: Agriculture focus areas with a tourism component;
- Zone 10: Agriculture areas with a commercial focus; and
- Zone 11: Major infrastructure corridors.

### 5.2. ZONE 1: PROTECTION OF NATURAL VEGETATION, SCENIC LANDSCAPE AND ROCK PAINTINGS AREAS, WITH LIMITED APPROPRIATE TOURISM

#### 5.2.1. Description

This zone represents areas with a generally high natural, visual and cultural quality that provides the core natural and cultural resource base for the establishment of the Waterberg as a conservation (even wilderness) destination. It is large and unique in form and character. The protection of the area as a whole is important.

#### 5.2.2. Desired state

##### Water utilisation

Water extraction from the natural system in this zone should be kept to an absolute minimum. Preservation of the water systems in the most natural state is desired. No additional damming of rivers or stream should be allowed in this zone.

##### Water quality

Water quality should be kept as clean and natural as possible to prevent ecological damage and to ensure that the quality of the water is maintained for downstream use. Implementation of legislation, compliance monitoring and enforcement should be a high priority in this zone. Where polluting sources from sewage disposal is suspected, it must be investigated and appropriate remedial measures should be taken.

##### Conservation

Conservation is the priority land-use in this zone and should be promoted as the core activity in every instance.

##### Tourism

Limited, low impact tourism facilities may be allowed in this zone provided that it does not have a negative impact on the conservation priority. Existing tourism facilities that do not comply to this zone may continue, provided that such activities are not expanded.

##### Agriculture

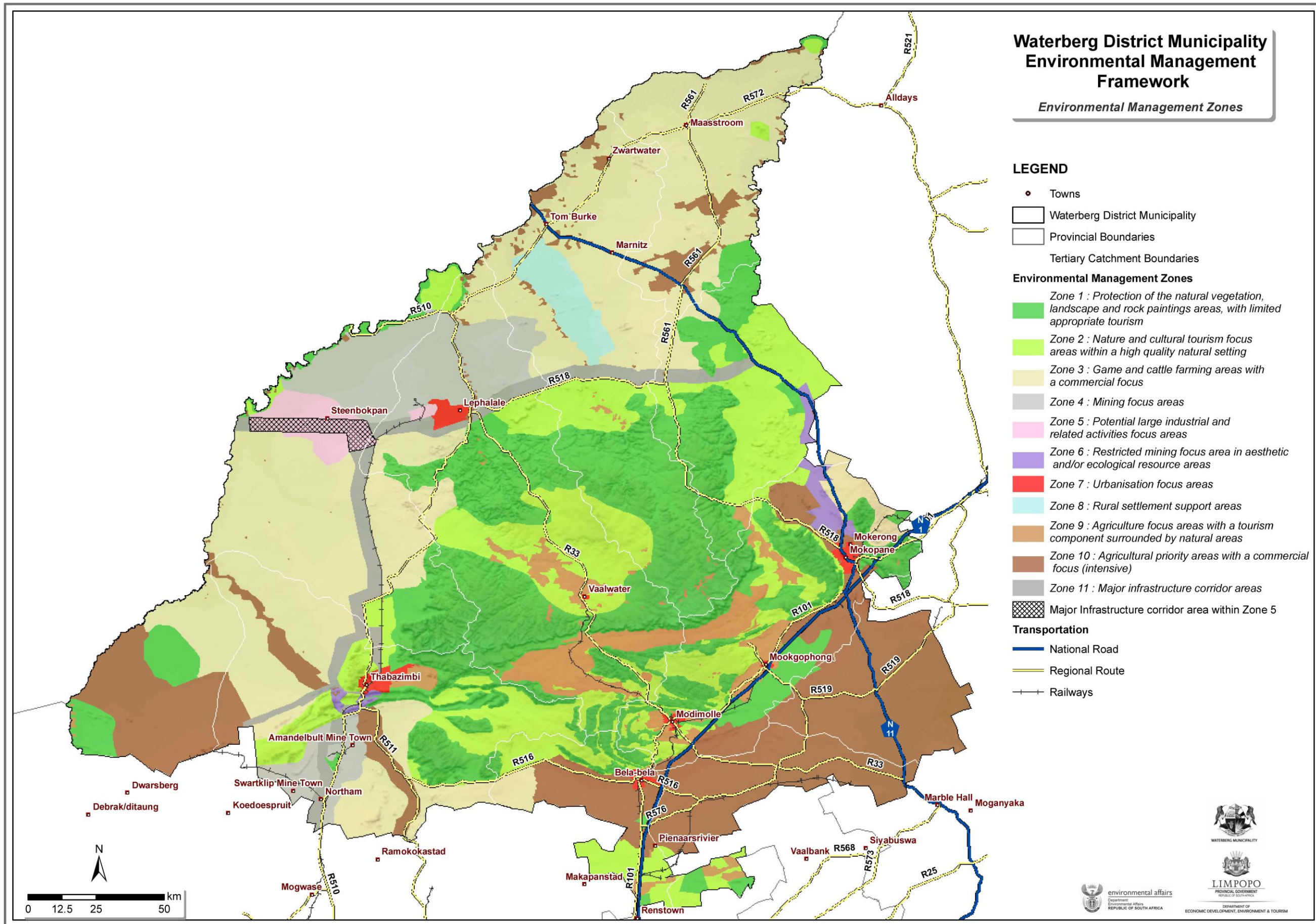
Agriculture is not desired in this zone. Existing agricultural activities may continue provided that such activities are not expanded.

##### Game and cattle farming

Game and cattle farming in this area must conform to the conservation requirements for this zone including the carrying capacity and the suitability of game species.

# Waterberg District Environmental Management Framework Report

Map 33: Environmental Management Zones



# Waterberg District Environmental Management Framework Report

## Business and retail

Business and retail is not desired in this zone and should be limited to existing facilities.

## Service infrastructure

Service infrastructure should be limited to what is necessary but should nonetheless be of a good quality. Roads should be kept to the minimum standard necessary but should be well maintained and safe to use. The maintenance of certain key existing roads as scenic routes should be encouraged.

## Solid waste disposal

Solid waste disposal is not desired in this zone. A programme should be established to deliver pre-sorted solid waste generated in this area to designated depots from where reuse, recycling and composting can be implemented.

## Sewage treatment and disposal

The disposal of any untreated sewage in this zone where there is a concentration of people in facilities such as lodges should not be allowed.

## Employment

Employment in the area should focus on conservation and related employment opportunities.

## Housing

Housing is not desired in this zone except for Vaalwater where as many as possible employees in the area should be accommodated.

### 5.2.3. Preferred, compatible and undesired developments

#### Preferred activities

- Conservation of nature in protected areas in terms of the National Environmental Management: Protected Areas Act.

#### Compatible activities

- Limited tourism facilities that take place in a manner that:

- Limits disturbance to natural vegetation to the minimum possible after undertaking an environmental assessment as required in terms of Government Notice No. R. 564 of 18 June 2010;
- does not consume additional natural resources;
- does not impact negatively on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views;
- recycles its waste products; and
- treats its sewage before release into natural streams.

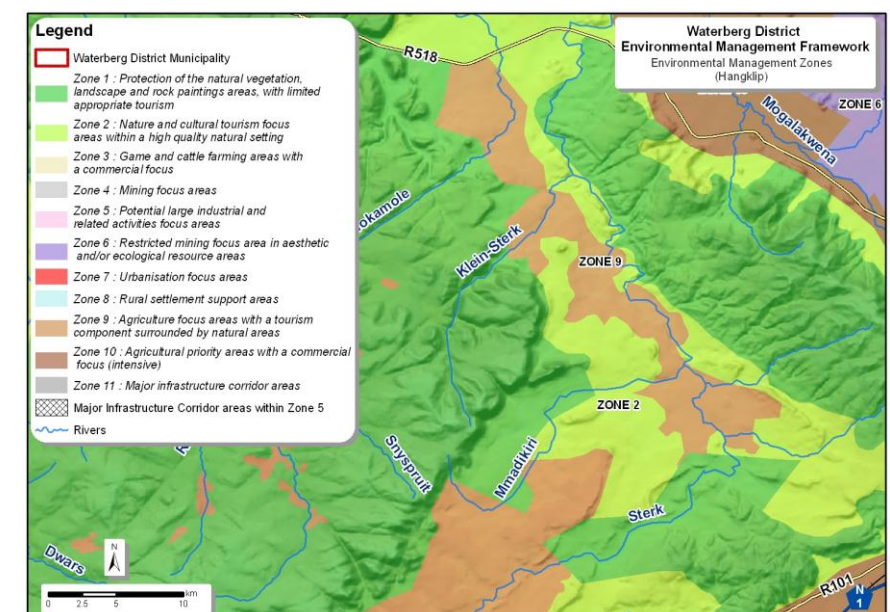
- Existing game farms that are managed with conservation as the core activity;
- Existing hunting activities but within the context of conservation of nature as the main priority;
- Existing farming activities that takes place in a manner that does not consume additional, natural resources and does not impact negatively on the sense of place of the area; and
- Existing and new unpaved roads that are maintained at a basic level to provide access to the area that do not require 4X4 vehicles in a way limits disturbance to natural vegetation to the minimum possible, after undertaking an environmental assessment as required in terms of Government Notice No.R. 564 of 18 June 2010.

#### Undesirable activities

- Mining of any sort;
- Industries of any sort;
- Energy generation plants of any sort;
- Urbanisation and residential settlement, including lifestyle estates;
- Golf courses and golf estates;

- Additional surfaced roads;
- Airfields and landing strips which should only be allowed if their need and desirability is such that their impact on the environment can be justified in an environmental assessment as required in terms of Government Notice No. R. 564 of 18 June 2010;
- Commercial buildings for use by the public of any sort;
- Industrial facilities; and
- Filling stations.

Map 34: Environmental Management Zones: Hangklip



### 5.3. ZONE 2: NATURE AND CULTURAL TOURISM FOCUS AREAS WITHIN A HIGH QUALITY NATURAL SETTING

#### 5.3.1. Description

This zone represents areas with a generally high, natural, visual and cultural quality that has significant potential for the development of nature and/or culture based tourism. It also forms the area from which the conservation use in zone 1 can be explored.

# Waterberg District Environmental Management Framework Report

## 5.3.2. Desired state

Water quality in this zone should not be allowed to deteriorate. Legislation to protect water quality and prevent pollution should be strictly enforced and policed.

### Water utilisation

Water extraction from the natural system in this zone should be kept to an absolute minimum. Preservation of the water systems in the most natural state is desired. No additional damming of rivers or stream should be allowed in this zone.

### Water quality

Water quality in this zone should not be allowed to deteriorate. Legislation to protect water quality and prevent pollution should be strictly enforced and policed.

### Conservation

Conservation is the secondary focus of this zone. As such, conservation legislation should be observed and enforced. Conservation areas should be well maintained to encourage further tourism to the zone.

### Tourism

Tourism within a conservation/natural setting should be the focus of activities and development in this zone. Sufficient facilities to accommodate tourists, at various levels, from basic to luxurious should be invested in. A possible unified brand for the Waterberg District's tourism and a definitive marketing strategy should be implemented to ensure the growth of the tourism industry in this zone, and the Waterberg District overall.

### Agriculture

Agriculture is not desired in this zone. Existing agricultural activities may continue provided that such activities are not expanded.

### Game and cattle farming

Game and cattle farming in this zone should not detract from the tourism experience of the zone.

### Business and retail

Large scale commercial business and retail is not desired in this zone. Instead, business that would promote and enhance tourism is desired. Such business could include curio shops, restaurants etc.

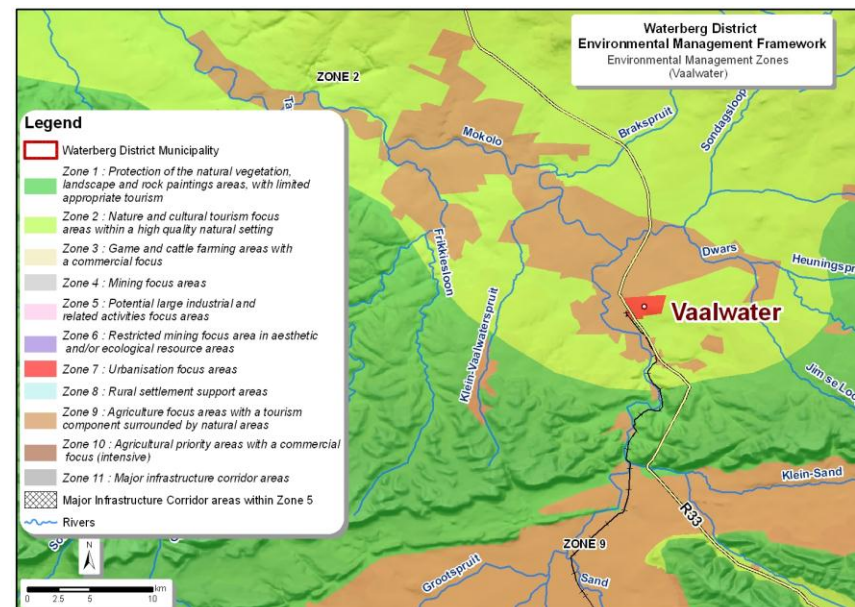
### Service infrastructure

Service infrastructure should be limited to what is necessary but should nonetheless be of a good quality. Roads should be kept to the minimum standard necessary but should be well maintained and safe to use. The maintenance of certain key existing roads as scenic routes should be encouraged.

### Solid waste disposal

Solid waste disposal is not desired in this zone. A programme should be established to deliver pre-sorted solid waste generated in this area to designated depots from where reuse, recycling and composting can be implemented.

**Map 35: Environmental Management Zones: Vaalwater**



### Sewage treatment and disposal

The disposal of any untreated sewage in this zone where there is a concentration of people in facilities such as lodges should not be allowed.

### Employment

Employment in the zone should be focused mainly in the tourism, hospitality and conservation sectors. Skills training programmes supported by the government and private sector is strongly desired.

### Housing

Housing should be limited to what is necessary in this zone. Housing in this zone should accommodate those employed at the tourism facilities and conservation areas.

## 5.3.3. Preferred, compatible and undesired developments

### Preferred activities

- Conservation of nature in protected areas in terms of the National Environmental Management: Protected Areas Act; and
- Tourism facilities that make use of the surrounding natural and cultural environments as the main attractions place in a manner that:
  - Limits disturbance to natural vegetation to the minimum possible after undertaking an environmental assessment as required in terms of Government Notice No. R. 564 of 18 June 2010;
  - does not consume additional natural resources;
  - does not impact negatively on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views;
  - recycles its waste products; and
  - treats its sewage before release into natural streams.

### Compatible activities

- Larger game lodges, country hotels, lifestyle estates within large nature/cultural areas that take place on disturbed

# Waterberg District Environmental Management Framework Report

sites (no clearing of indigenous vegetation should be allowed) in a manner that:

- Limits disturbance to natural vegetation to the minimum possible after undertaking an environmental assessment as required in terms of Government Notice No. R. 564 of 18 June 2010;
- does not impact negatively on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views;
- recycles its waste products; and
- treats its sewage before release into natural streams.
- Existing game farms that are managed with conservation as the core activity;
- Existing hunting activities but within the context of conservation of nature as the main priority;
- Existing farming activities that takes place in a manner that does not consume additional, natural resources and does not impact negatively on the sense of place of the area; and
- Existing roads that are maintained at a level that is safe and appropriate for tourism activities.

## Undesirable activities

- Mining of any sort;
- Industries of any sort;
- Energy generation plants with the exception of those that provide carbon free energy to the local area on disturbed areas in a manner that does not have a negative impact on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views;
- Urbanisation and dense residential settlement; and
- Golf courses and golf estates.

## 5.4. ZONE 3: GAME AND CATTLE FARMING (INCLUDING HUNTING) AREAS WITH A COMMERCIAL FOCUS

### 5.4.1. Description

This zone represents areas with largely natural vegetation that is used extensively for grazing by game and/or cattle.

### 5.4.2. Desired state

#### Water utilisation

Water should be treated as a scarce resource in this area.

#### Water quality

Water quality in this zone should not be allowed to deteriorate.

#### Conservation

Although nature conservation is not the focus in this area, farms should be managed in such a way that the natural vegetation cover is maintained in a good sustainable condition.

#### Tourism

Tourism in the form of commercial hunting lodges and game viewing should be encouraged as secondary activities in this zone.

#### Agriculture

Agriculture is not desired in this zone. Existing agricultural activities may continue provided that such activities are not expanded.

#### Game and cattle farming

Commercial game and cattle farming is the focus of this zone. This includes commercial hunting. The focus of this zone is farming in order to make a profit, with conservation of nature as a secondary benefit.

#### Business and retail

Large scale commercial business and retail is not desired in this zone. Business should adhere to local planning requirements.

#### Service infrastructure

Service infrastructure should be limited to what is necessary but should nonetheless be of a good quality. Roads should be kept to the minimum standard necessary, but should be well maintained and safe to use.

#### Solid waste disposal

Solid waste disposal is not desired in this zone. A programme should be established to deliver pre-sorted solid waste generated in this area to designated depots from where reuse, recycling and composting can be implemented.

#### Sewage treatment and disposal

The disposal of any untreated sewage in this zone (where there is a concentration of people in facilities such as lodges) should not be allowed.

#### Employment

Employment in the zone should be focused mainly in the game farming, cattle farming, hunting, and hospitality sectors. Skills training programmes for local people, supported by the government and private sector, is desired.

#### Housing

No urbanisation of any kind should be allowed in this zone.

### 5.4.3. Preferred, compatible and undesired developments

#### Preferred activities

- Keeping of game and/or cattle for commercial purposes in a responsible manner that makes sustainable use of the natural vegetation cover of the area; and
- Tourism facilities, including hunting lodges in a manner that:
  - Limits disturbance to natural vegetation to the minimum possible after undertaking an

# Waterberg District Environmental Management Framework Report

environmental assessment as required in terms of Government Notice No. R. 564 of 18 June 2010;

- does not consume additional natural resources;
- does not impact negatively on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views;
- recycles its waste products; and
- treats its sewage before release into natural streams.

## Compatible activities

- Larger game lodges, country hotels, lifestyle estates within large nature/cultural areas that take place in a manner that:
  - Limits disturbance to natural vegetation to the minimum possible after undertaking an environmental assessment as required in terms of Government Notice No. R. 564 of 18 June 2010;
  - does not consume additional natural resources;
  - does not impact negatively on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views;
  - recycles its waste products; and
  - treats its sewage before release into natural streams.
- Existing farming activities that takes place in manner that does not consume additional, natural resources and does not impact negatively on the sense of place of the area; and
- Existing roads that are maintained at a level that is safe and appropriate for tourism activities.

## Undesirable activities

- Mining of any sort;

- Industries of any sort;
- Energy generation plants with the exception of those that provide carbon free energy to the local area on disturbed areas in a manner that does not have a negative impact on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views;
- Urbanisation and dense residential settlement; and
- Golf courses and golf estates.

## 5.5. ZONE 4: MINING FOCUS AREA

### 5.5.1. Description

This zone represents areas where significant mineral resources of strategic national importance occur within largely natural environments.

### 5.5.2. Desired state

#### Water utilisation

Larger scale water utilisation will be necessary to support mining and industrial activities in this zone. Activities should not be allowed to proceed unless the necessary water allocations and permits are in place.

#### Water quality

Water quality in this zone should not be allowed to deteriorate. Legislation to protect water quality and prevent pollution should be strictly enforced. Heavy penalties should be imposed on pollution caused by mining and industry.

#### Conservation

Conservation of natural habitat should be the primary focus of required buffer areas around mining and industrial sites. Preference should be given to catering for threatened species that may occur in this zone.

#### Tourism

N/A.

## Agriculture

Agriculture is not desired in this zone. Existing agricultural activities may continue provided that such activities are not expanded.

## Game and cattle farming

Game and cattle farming should be the default activity in parts of the zone that is not used for mining or industrial purposes.

## Business and retail

N/A.

## Service infrastructure

Service infrastructure should be sufficient to support both mining and other developments in the area. Transport infrastructure is of particular importance. A strategy for the transport of coal out of the Waterberg District, by rail or by road should be carefully planned. The current infrastructure is insufficient.

Service infrastructure development in the area should also cater for the influx of people associated with the new developments in these zones.

## Solid waste disposal

All solid waste should be discarded at permitted solid waste sites. Sufficient permitted solid waste disposal sites should be established at key locations to deal with the waste generated in this zone. Strict enforcement and proper management at such sites is necessary to minimise negative impact. Recycling collection points should be encouraged wherever possible.

## Sewage treatment and disposal

Sewage treatment plants and disposal sites capable of properly dealing with the sewage and waste water generated in the area is necessary to prevent pollution of rivers and streams.

# Waterberg District Environmental Management Framework Report

## Employment

Employment in the zone should be focussed on providing opportunities for local unemployed people. This should go hand in hand with appropriate education and training.

## Housing

Housing the area should preferably be concentrated in urban areas where the benefits of high densities can be exploited in respect to education facilities, health care facilities and the efficient provision of municipal services.

### 5.5.3. Preferred, compatible and undesired developments

#### Preferred activities

- Mining of minerals;
- Industrial activities that are directly associated with mining provided that it is accommodated in such a manner that it does not restrict or constrain potential mineral exploitation; and
- Roads and railway infrastructure that is necessary for the safe and proper transportation of mineral products and people.

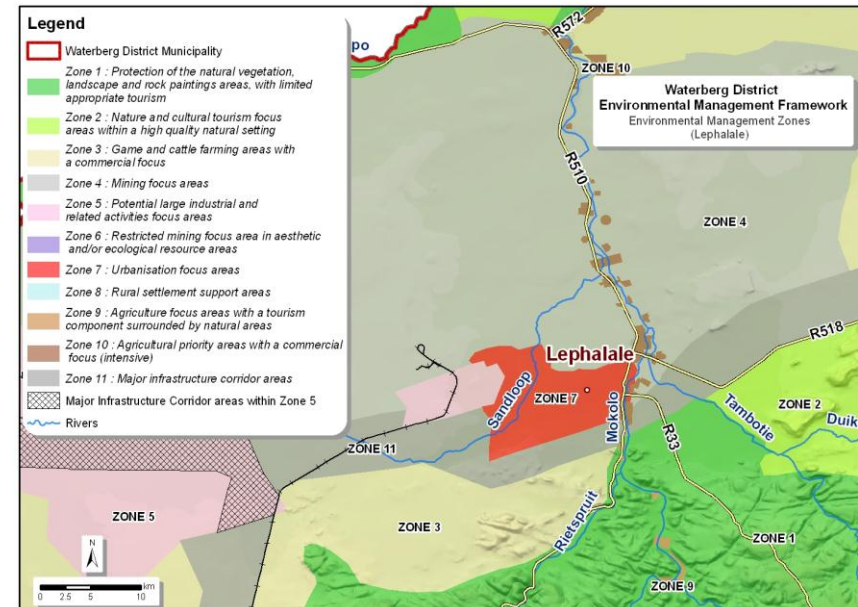
#### Compatible activities

- Existing farming activities;
- Keeping of game and/or cattle for commercial purposes in a responsible manner that makes sustainable use of the natural vegetation cover of the area in parts where mining is not possible or where mining will only become a factor in the medium to long term; and
- Tourism facilities on disturbed land, including hunting lodges (indigenous vegetation should not be removed) in parts where mining is not possible or where mining will only become a factor in the medium to long term.

## Undesirable activities

- Any activity that sterilises the potential to explore a mineral resource in the area, for example constructing buildings on top of the mineral resource.

Map 36: Environmental Management Zones: Lephalale



### 5.6. ZONE 5: POTENTIAL LARGE INDUSTRIAL AND RELATED ACTIVITIES FOCUS AEAS

#### 5.6.1. Description

This zone represents areas in close proximity to major coal fields which are being considered for the development of industrial activities to beneficiate the mineral product and where infrastructure like power generation facilities are being considered. The zone's relationship to existing and likely future transportation infrastructure and necessary urban development is also important.

#### 5.6.2. Desired state

##### Water utilisation

Larger scale water utilisation will be necessary to support mining and industrial activities in this zone. Activities should not be allowed to proceed unless the necessary water allocations and permits are in place.

## Water quality

Water quality in this zone should not be allowed to deteriorate. Legislation to protect water quality and prevent pollution should be strictly enforced. Heavy penalties should be imposed on pollution caused by mining and industry.

## Conservation

Conservation of natural habitat should be the primary focus of required buffer areas around mining and industrial sites. Preference should be given to catering for threatened species that may occur in this zone.

## Tourism

N/A.

## Agriculture

Agriculture is not desired in this zone. Existing agricultural activities may continue provided that such activities are not expanded.

## Game and cattle farming

Game and cattle farming should be the default activity in parts of the zone that is not used for mining or industrial purposes.

## Business and retail

N/A.

## Service infrastructure

Service infrastructure should be sufficient to support both mining and other developments in the area. Transport infrastructure is of particular importance. A strategy for the transport of coal out of the Waterberg District, by rail or by road should be carefully planned. The current infrastructure is insufficient.

Service infrastructure development in the area should also cater for the influx of people associated with the new developments in these zones.

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## **Solid waste disposal**

All solid waste should be discarded at permitted solid waste sites. Sufficient permitted solid waste disposal sites should be established at key locations to deal with the waste generated in this zone. Strict enforcement and proper management at such sites is necessary to minimise negative impact. Recycling collection points should be encouraged wherever possible.

## **Sewage treatment and disposal**

Sewage treatment plants and disposal sites capable of properly dealing with the sewage and waste water generated in the area is necessary to prevent pollution of rivers and streams.

## **Employment**

Employment in the zone should be focussed on providing opportunities for local unemployed people. This should go hand in hand with appropriate education and training.

## **Housing**

Housing the area should preferably be concentrated in urban areas where the benefits of high densities can be exploited in respect to education facilities, health care facilities and the efficient provision of municipal services.

### **5.6.3. Preferred, compatible and undesired developments**

#### **Preferred activities**

- Heavy industrial activities that operate within national standards that regulate pollution;
- Urban support functions such as residential and commercial development that is directly related to large industries of national magnitude and in accordance with the local authority approval process;
- Support services and light industrial activity directly related and in support of the heavy industrial activities;

- Keeping of game and/or cattle for commercial purposes in a responsible manner that makes sustainable use of the natural vegetation cover of the area in parts where industry and related activities are not possible or where industry will only become a factor in the medium to long term;
- Tourism facilities on disturbed land, including hunting lodges (indigenous vegetation should not be removed) in parts where industry and related activities are not possible or where industry will only become a factor in the medium to long term.

#### **Compatible activities**

- Existing farming activities;
- Roads, railways and other infrastructure that is necessary for the safe and proper transportation of industrial products and people.

#### **Undesirable activities**

- Any activity that does not meet national standards in terms of pollution of the air, water or land.
- Uncoordinated and/or fragmented urban areas, industry and infrastructure that results in lower efficiencies, higher costs, greater environmental impact and the area not reaching its full economic and social potential.
- Proclamation of any land use including conservation that would reduce the industrial potential of the area.

### **5.7. ZONE 6: RESTRICTED MINING FOCUS AREAS IN AESTHETIC AND/OR ECOLOGICAL RESOURCE AREAS**

#### **5.7.1. Description**

Water utilisation should be kept to a minimum. Ecological water requirements should be met at all times.

#### **5.7.2. Desired state**

##### **Water utilisation**

Water utilisation should be kept to a minimum. Ecological water requirements should be met at all times.

##### **Water quality**

Water quality in this zone should not be allowed to deteriorate. Legislation to protect water quality and prevent pollution should be strictly enforced. Heavy penalties should be employed to punish users who pollute water sources.

##### **Conservation**

Conservation of ecological and/or aesthetic resources should be a prerequisite to mining and industrial development in the area.

##### **Tourism**

Tourism should be encouraged as a secondary activity especially in respect to cultural tourism.

##### **Agriculture**

Agriculture is not desired in this zone. Existing agricultural activities may continue provided that such activities are not expanded.

##### **Game and cattle farming**

Game and cattle farming is a secondary activity in these areas.

##### **Business and retail**

N/A.

##### **Service infrastructure**

Service infrastructure should be sufficient to support mining in the area. Transport infrastructure is of particular importance. The impact of heavy vehicle traffic especially through towns should be limited.

##### **Solid waste disposal**

All solid waste should be discarded at permitted solid waste sites. Sufficient permitted solid waste disposal sites should be

# Waterberg District Environmental Management Framework Report

established at key locations to deal with the waste generated in this zone. Strict enforcement and proper management at such sites is necessary to minimise negative impact. Recycling collection points should be encouraged wherever possible.

## Sewage treatment and disposal

Sewage treatment plants and disposal sites capable of properly dealing with the sewage and waste water generated in the area is necessary to prevent pollution of rivers and streams.

## Employment

Employment in the zone should be focussed on providing opportunities for local unemployed people. This should go hand in hand with appropriate education and training.

## Housing

Housing the area should preferably be concentrated in existing urban areas.

## 5.7.3. Preferred, compatible and undesired developments

### Preferred activities

- Mining of minerals that is done in a well planned manner that will ensure that it will not cause widespread and unacceptable damage to the aesthetic and/or ecological values of the area; and
- Keeping of game and/or cattle for commercial purposes in a responsible manner that makes sustainable use of the natural vegetation cover of the area in parts where mining is not possible or where mining will only become a factor in the medium to long term.

### Compatible activities

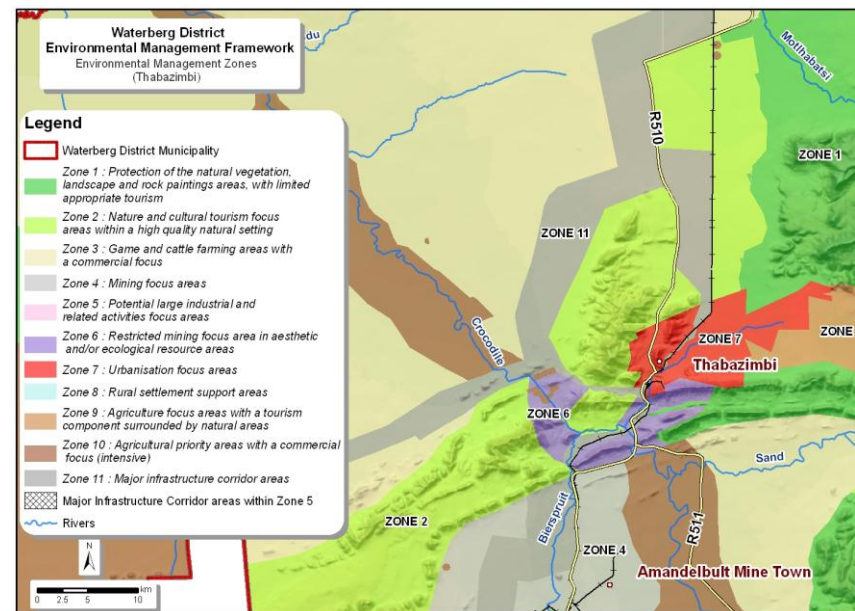
- Tourism facilities, including hunting lodges (indigenous vegetation should not be removed) in parts where mining is not possible or where mining will only become a factor in the medium to long term.

- Existing farming activities; and
- Roads and railway infrastructure that is necessary for the safe and proper transportation of mineral products.

### Undesirable activities

- Any activity that sterilises the potential to explore a mineral resource in the area.

**Map 37: Environmental Management Zones: Thabazimbi**



## 5.8. ZONE 7: URBANISATION FOCUS AREAS AND NODES

### 5.8.1. Description

This zone represents areas that have been designated as the areas that form the urban development boundaries as defined by the relevant local Spatial Development Frameworks (SDF).

### 5.8.2. Desired state

#### Water utilisation

The main water utilisation in this zone will be for human consumption.

#### Water quality

Water quality in this zone should not be allowed to deteriorate. Legislation to protect water quality and prevent pollution should be

strictly enforced and policed. The quality of water supplied should be monitored at all times to ensure that it remains potable.

### Conservation

Conservation should be focussed on cultural historical elements that can contribute to the character of towns.

### Tourism

Some tourism (to take advantage of the people and culture of the area) could take place.

### Agriculture

N/A.

### Game and cattle farming

N/A.

### Business and retail

Commercial business and retail is a primary function of these zones.

### Service infrastructure

Service infrastructure should be sufficient to support the anticipated growth of urban areas. Transport infrastructure is of particular importance.

### Solid waste disposal

All solid waste should be discarded at permitted solid waste sites. Sufficient permitted solid waste disposal sites should be established at key locations to deal with the waste generated in this zone. Strict enforcement and proper management at such sites is necessary to minimise negative impacts. Recycling collection points should be encouraged wherever possible.

### Sewage treatment and disposal

Sewage treatment plants and disposal sites capable of properly dealing with the sewage and waste water generated in the area is necessary to prevent pollution of rivers and streams. Compliance monitoring and enforcement is important.

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## Employment

Employment in the zone should be focussed on providing opportunities for local unemployed people. This should go hand in hand with appropriate education and training.

## Housing

The identified urban areas should become the focus for housing that serves the surrounding area as well as education facilities, health care facilities and the efficient provision of municipal services.

### 5.8.3. Preferred, compatible and undesired developments

#### Preferred activities

- All urban functions in accordance with the relevant SDF; and
- Tourism facilities that serves the region with specific emphasis on cultural and historical elements within towns.

#### Compatible activities

- Existing farming activities; and
- Roads infrastructure that is necessary and safe for use by the population in the district.

#### Undesirable activities

- Any activity that hinders the towns to fulfil their urban densification functions.

## 5.9. ZONE 8: RURAL SETTLEMENT AREAS

### 5.9.1. Description

This zone represents areas where large rural communities are mainly dependent on subsistence in conditions that are often not ideal. The historic factors that led to the current situation in these areas and that continue to manifest itself in poverty must also be recognised.

### 5.9.2. Desired state

Water utilisation in this zone should be primarily used for human consumption and subsistence farming. The protection of underground water resources is very important in these areas, both in terms of reserves and the prevention of pollution.

#### Water utilisation

Water utilisation in this zone should be primarily used for human consumption and subsistence farming. The protection of underground water resources is very important in these areas, both in terms of reserves and the prevention of pollution.

#### Water quality

Water quality in this zone should not be allowed to deteriorate. Legislation to protect water quality and prevent pollution should be strictly enforced. Education in the possible hazards involved in water consumption directly from rivers and other untreated water supplies should be provided.

#### Conservation

N/A.

#### Tourism

Cultural tourisms should be encouraged in this zone.

#### Agriculture

Subsistence farming is a key element of survival in this zone. Education and farming skills training is essential to ensure that the soil resource is not degraded any further and that sustainable farming practices are adopted.

#### Game and cattle farming

Game and cattle farming should be the default activity in parts of the zone that is not used for other purposes.

#### Business and retail

Commercial business and retail in support of the rural communities should be encouraged.

## Service infrastructure

Basic infrastructure and services should be provided.

## Solid waste disposal

The reuse and recycling of solid waste within the communities should be encouraged as a contributing economic activity in this zone.

## Sewage treatment and disposal

Efficient water borne sewage systems will not be feasible in all places due to the relatively low density of the dwellings in these areas. Pit latrines are therefore acceptable within these areas.

## Employment

People in these areas are mostly self employed and the focus should be education and training with government support to enhance skills and increase economic activity.

## Housing

Government should support the replacement of informal structures with formal structures and also encourage urbanisation to cities and towns.

### 5.9.3. Preferred, compatible and undesired developments

#### Preferred activities

- Sustainable subsistence farming supported by government initiatives in respect to land utilisation, training and financial support;
- The development of secondary economic enterprises and entrepreneurial skills that primarily targets the needs of the communities in these areas; and
- Cultural tourism facilities.

#### Compatible activities

- Existing farming activities;

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- Roads and other infrastructure that is necessary for the development of these areas.

## Undesirable activities

- Any activity or development that negatively affects a poor person in the area.

## 5.10. ZONE 9: AGRICULTURE FOCUS AREAS WITH A TOURISM COMPONENT

### 5.10.1. Description

This zone represents areas with a strong rural agricultural character that is surrounded by areas of generally high natural, visual and cultural quality that has significant potential for the development of nature and/or culture based tourism in addition to agriculture. It also forms the area from which the conservation use in zone 1 can be explored and experienced (especially in areas that lies below the escarpment).

### 5.10.2. Desired state

#### Conservation

These areas are surrounded by natural areas with prominent visual features (e.g. the Waterberg escarpment). It is therefore a zone from which spectacular natural scenes can be viewed and should therefore be maintained as agricultural land in order to maintain the rural harmony that currently exist between this zone and Zone 1.

#### Tourism

Limited tourism facilities on farms should be encouraged in this zone.

#### Agriculture

Commercial agriculture is the main focus of this zone.

#### Game and cattle farming

N/A.

#### Business and retail

Business and retail is not a focus in this zone.

#### Service infrastructure

Service infrastructure in the form of roads is especially important. Well maintained roads will ensure that agricultural produce can be efficiently transported to the relevant markets.

#### Solid waste disposal

Large scale solid waste disposal is not desired in this zone. Central points for waste collection and recycling should be determined.

#### Sewage treatment and disposal

N/A.

#### Employment

Appropriate skills training facilities, supported by both the government and private sectors would help to uplift people on the farms and should align the area.

#### Housing

Farms provide essential housing in rural areas for a large population. Housing in this zone should accommodate those employed within the agricultural sector.

### 5.10.3. Preferred, compatible and undesired developments

#### Preferred activities

- Agriculture activities (livestock keeping and cultivation); and
- Tourism facilities at homesteads or on land that is not suitable for cultivation that makes use of the surrounding natural and cultural environments as the main attractions.

#### Compatible activities

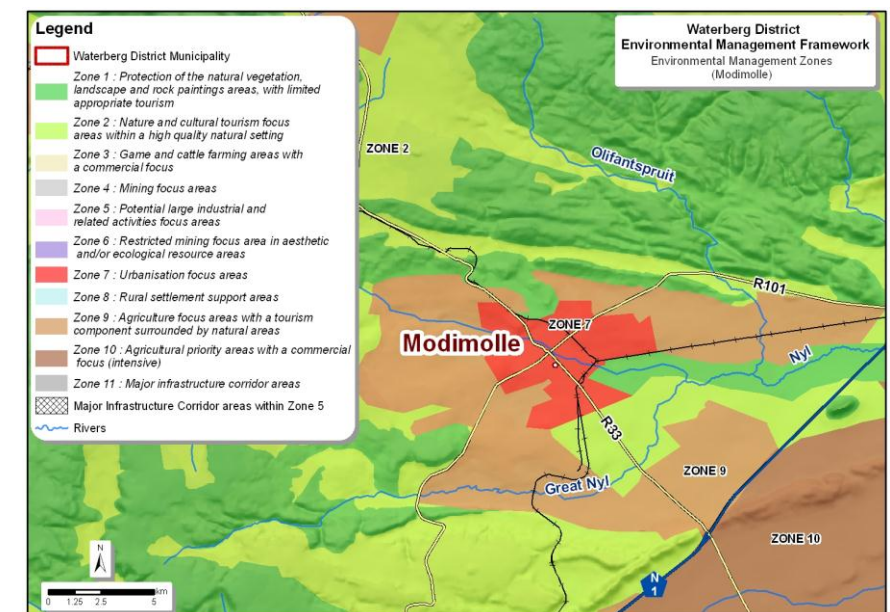
- Existing game farms that are managed in a way that does not exceed the capacity of the vegetation to carry the game that is stocked on the farm;

- Existing hunting activities on game farms; and
- Existing roads that are maintained at a level that is safe and appropriate for agricultural activities.

## Undesirable activities

- Mining of any sort;
- Industries with the exception of agro-industry as part of farming operations;
- Energy generation plants with the exception of those that provide carbon free energy to the local area on disturbed areas in a manner that does not have a negative impact on the sense of place of the area, being particularly sensitive to not breaking the skyline or impeding on views;
- Urbanisation and dense residential settlement; and
- Golf courses and golf estates.

Map 38: Environmental Management Zones: Modimolle



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## 5.11. ZONE 10: AGRICULTURE AREAS WITH A COMMERCIAL FOCUS

### 5.11.1. Description

This zone represents areas with a strong rural agricultural character and is important for food production, food security and the employment opportunities that are linked to the agricultural activities. Agriculture is the main activity that occurs in these areas.

### 5.11.2. Desired state

#### Water utilisation

Sustainable use of water for irrigation should be the priority in these areas.

#### Water quality

Water quality in this zone should not be allowed to deteriorate. Legislation to protect water quality and prevent pollution should be strictly enforced, especially pollution from fertilisers and pesticides.

#### Conservation

N/A.

#### Tourism

N/A.

#### Agriculture

Commercial agriculture is the main focus of this zone. Agriculture provides employment and stability. Land with high agricultural potential should be protected and reserved for agricultural purposes. Support of emerging land owners is desired, so that they may utilise their land productively and responsibly. This support should also include skills training and technical support.

#### Game and cattle farming

N/A.

#### Business and retail

Business and retail is not a focus in this zone.

#### Service infrastructure

Service infrastructure in the form of roads is especially important. Well maintained roads will ensure that agricultural produce can be efficiently transported to the relevant markets.

#### Solid waste disposal

Large scale solid waste disposal is not desired in this zone. Central points for waste collection and recycling should be determined.

#### Sewage treatment and disposal

N/A.

#### Employment

Appropriate skills training facilities, supported by both the government and private sectors would help to uplift people on the farms and should align the area.

#### Housing

Farms provide essential housing in rural areas for a large population. Housing in this zone should be to accommodate those employed within the agricultural sector.

### 5.11.3. Preferred, compatible and undesired developments

#### Preferred activities

- Agriculture activities with an emphasis on dry land as well as irrigated crop cultivation; and
- Infrastructure that support agricultural production, including agro-industries.

#### Compatible activities

- Cattle and game farming that are managed in a way that does not exceed the capacity of the vegetation to carry the cattle or game that is stocked on the farm; and
- Existing roads that are maintained at a level that is safe and appropriate for agricultural activities.

#### Undesirable activities

- Any activity that reduces the potential of the land, including soil and landscape transformation, to support agriculture;
- Mining activities;
- Industries with the exception of agro-industry as part of farming operations;
- Energy generation plants of any sort including wind turbines and solar panels and reflectors (excluding small systems that are used on farms);
- Urbanisation and dense residential settlement; and
- Golf courses and golf estates.

## 5.12. ZONE 11: MAJOR INFRASTRUCTURE CORRIDORS

### 5.12.1. Description

This zone represents areas where the concentration of linear infrastructure proposed in order to prevent the unnecessary large impact that uncoordinated infrastructure location would have on the district. The following was considered in defining the corridors:

- The environmental management zones with their underlying sensitivities;
- Existing infrastructure and routes;
- Expected future development; and
- Existing and potential future links outside the district.

In interpreting the corridors the following must be taken into account:

- The corridors were situated in such a way that it provides practical routes for linear infrastructure; and
- The sensitive areas (Zones 1 and 2" that occurs "inside" (to the east or south) of the corridors are sensitive to visually sensitive to large scale intrusions. The "inside" boundaries of the corridor should therefore be regarded as hard or

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fixed boundaries while the outside boundaries (to the west and north) of the corridors can be regarded as soft in instances where technical requirements necessitates a wider separation between linear infrastructure.

## 5.12.2. Desired state

This zone mostly forms part of the game and cattle farming areas (Zone 4). It is however proposed that these areas also be used as the major corridors for bulk infrastructure including high voltage power lines, railway lines, major roads and pipelines. This is necessary in order to prevent these infrastructure elements from impacting negatively on more sensitive areas in the district. The desired state as expressed under Zone 3, also applies to these areas.

## Transport policy

The policy of the Department of Transport is reflected in the speech of the Minister of Transport on 27 September 2010 - "Rail is also a key part of our plans to move both our freight and passengers from road to rail". In the context of the Waterberg it is especially relevant to the transportation of coal. The transport of coal must be done by rail and road transport of coal must be phased out as soon as possible. The upgrade of the Thabazimbi to Lephalale railway line, associated infrastructure and running stock is therefore a high priority from both an economic and environmental perspective.

## Rhino at Goudrivier



Photo: P. Claassen

## 5.12.3. Preferred, compatible and undesired developments

### Preferred activities

- Linear infrastructure including major roads, railway lines, electricity distribution lines, pipelines, etc.;

### Compatible activities

- Existing farming activities;
- Keeping of game and/or cattle for commercial purposes in a responsible manner that makes sustainable use of the natural vegetation cover of the area; and
- Existing linear infrastructure.

### Undesirable activities

- Any activity or development that will compromise the functioning of the areas as a corridor.

## 5.13. NEMA 24(2)(B) AND (C) IMPLEMENTATION

The listed activities in Listing Notice 3 (Notice No. R. 546 in the Government Gazette of 18 June 2010) will apply to Zones 1 and 2 as being "sensitive areas as identified in an environmental management framework...".

It is recommended that that local service infrastructure development and maintenance activities that are listed in terms of Listing Notice 1 (Notice No. R. 544 in the Government Gazette of 18 June 2010) and Listing Notice 2 (Notice No. R. 545 in the Government Gazette of 18 June 2010) be excluded from applications as provided for in NEMA 24(2)(c) where such areas fall outside Zones 1 or 2. This must be done during the next revision of the listing notices by the DEA.

## Towards Hangklip



Photo: S. Taljaardt

## Grootegeeluk Mine



Photo: D. Jansen van Vuuren

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**Rock paintings**



Photo: P. Claassen

**Nylsvley**



Photo: D. Jansen van Vuuren

**Soil erosion in an old alluvial deposit (old river floodplain)**



Photo: P. Claassen

**Waterberg District Landscape**



Photo: D. Jansen van Vuuren

# Waterberg District Environmental Management Framework Report

## 6. WATERBERG BIOSPHERE RESERVE<sup>15</sup>

### 6.1. INTRODUCTION

Biosphere reserves are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use. The concept of Biosphere Reserves was developed by UNESCO. Worldwide, there are currently 551 Biosphere sites located in 107 countries.

A biosphere reserve is intended to fulfil 3 basic functions<sup>16</sup>:

- a conservation function - to contribute to the conservation of landscapes, ecosystems, species and genetic variation;
- a development function - to foster economic and human development which is socio-culturally and ecologically sustainable;
- a logistic function - to provide support for research, monitoring, education and information exchange related to local, national and global issues of conservation and development.

The Waterberg Biosphere Reserve was established and gained formal status under UNESO's Man and Biosphere (MaB) programme in 2001. It is the first 'savanna' Biosphere registered in southern Africa.

The Biosphere Reserve Statutory Framework makes provision for a periodic review of Biosphere Reserves every 10 years. The periodic review reports are prepared by the concerned authority, and forwarded to the UNESCO Secretariat. Currently the Waterberg Biosphere Reserve Management plan is being prepared as per commission of the Waterberg District Municipality. The reviewed Biosphere boundaries as provided by the Waterberg Biosphere Reserve Management Plan project team, and will be

submitted to UNESCO for review, have been included in this report.

Biosphere reserves are organised into 3 interrelated zones; the core area; the buffer zone and the transition area. According to UNESCO only the core area requires legal protection. Meaning these areas usually correspond to existing protected areas such as nature reserves or national parks.

### 6.2. WATERBERG BIOSPHERE RESERVE AND EMF INTERACTION

The consultants working on the revision of the Waterberg Biosphere Reserve boundaries and its management plan worked closely with the Waterberg District EMF project team. This ensured that the boundaries of the Environmental Management Zones and the Waterberg Biosphere Reserve are compatible.

The core areas of the Waterberg Biosphere Reserve fall within Zone 1 of the Environmental Management Zones. Zone 1 is described as an area where the protection of the natural vegetation, landscape and rock paintings areas should take place, with limited and appropriate tourism. These core areas include formally protected areas such as:

- Nylsvley Nature Reserve;
- Marakele National Park ;
- Marekele Contractual Park;
- Mokholo Dam Nature Reserve and incorporated land; and
- Masebe Nature Reserve

They also include several areas that are in the process of seeking formal protection and that are currently run as conservation areas.

These core wilderness areas are defined in terms of a biosphere as protected sites for conserving biological diversity, monitoring minimally disturbed ecosystems, and undertaking non-destructive research and other low-impact uses, such as education.

The buffer zones fall mostly in Environmental Management Zone (EMZ) 1 but also partly in other Zones. The buffer zones are

adjacent or surrounding the core zones. In terms of the biosphere, the buffer zone should be used for activities compatible with sound ecological practices, including environmental education, recreation, ecotourism and applied basic research. These buffer areas also form important links between the core areas. They are representative of areas that are still in a natural or near natural state.

A flexible transition area, defined in terms of the biosphere as areas which may contain a variety of agricultural activities, settlements and other uses and in which local communities, management agencies, scientists, non-governmental organisations, cultural groups, economic interests and other stakeholders work together to manage and sustainably develop the area's resources. The transition zone has been divided into two sub-zones for the Waterberg Biosphere Reserve. This is to distinguish the areas of high impact from the areas of low impact. Transition Zone 1 allows for a higher level of tourism development but still retains the overall undisturbed natural character of the area. This transition zone corresponds with EMZ 1 and EMZ 2. Transition Zone 2 provides for more intensive cultivation, agro-industries, human settlements and support services to the agricultural and tourism industries. This transition zone corresponds with Zone 9, which is described as an agriculture focus areas with a tourism component surrounded by natural areas.

### 6.3. CONCLUSION

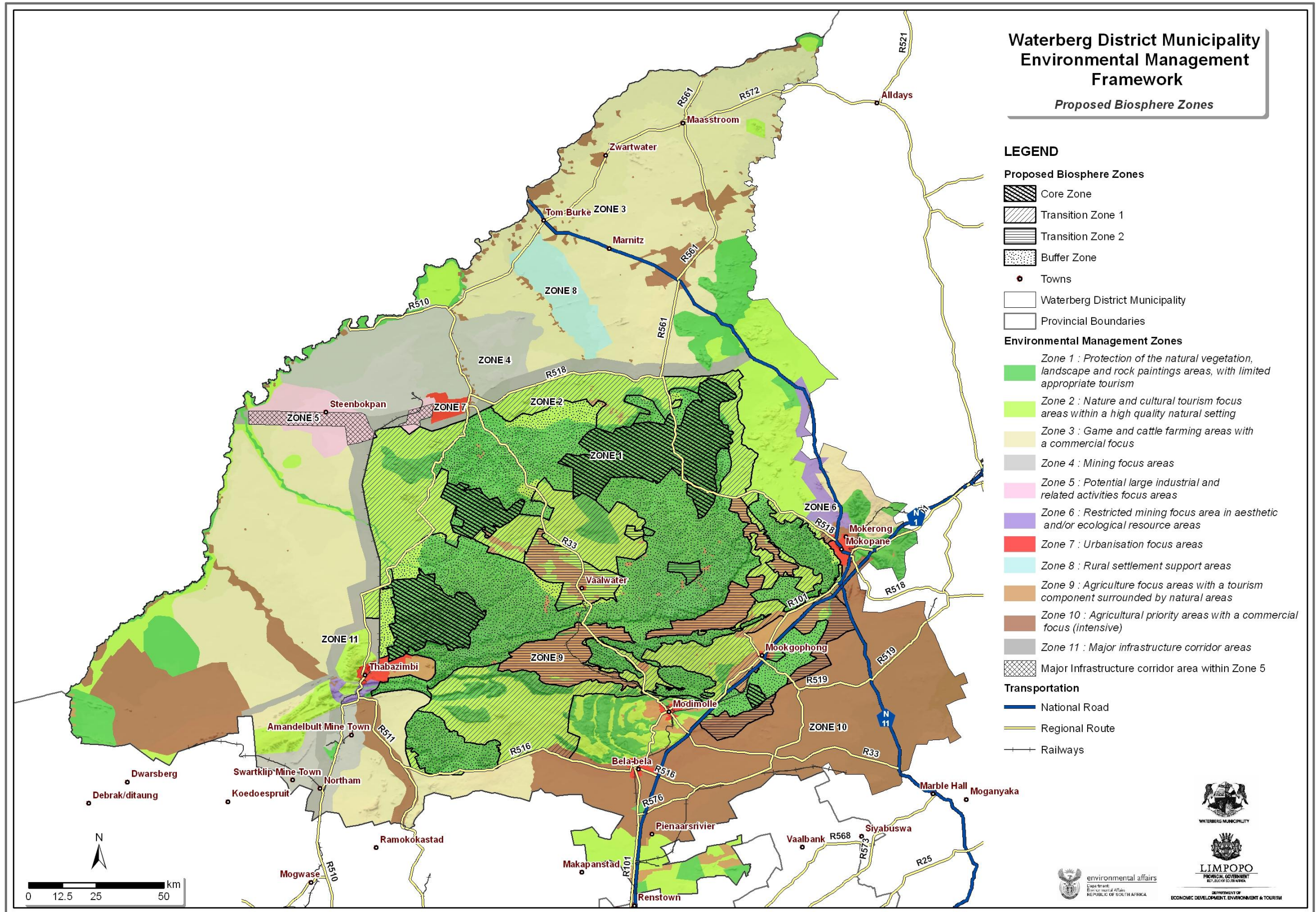
In South Africa, the term "biosphere" is used to describe areas of conservation value where a group of landowners, such as farmers, provincial authorities or the state have combined forces to have an area declared a conservancy, a natural protected area or an area of unique ecological value. These areas are under the management of the landowners who manage the resources of the area in a sustainable manner. The biospheres may also have significant scientific or other resource value.<sup>17</sup>

<sup>15</sup> Partly sourced from the draft Waterberg Biosphere Reserve Management Plan

<sup>16</sup> Source [www.unesco.org/mabdb](http://www.unesco.org/mabdb)

<sup>17</sup> Source DEA

# Waterberg District Environmental Management Framework Report



## 7. ENVIRONMENTAL MANAGEMENT GUIDELINES

### 7.1. INTRODUCTION

The environmental management guidelines provide a detailed set of measures that will assist in achieving specific outcomes in the Waterberg District. Where appropriate the guidelines are also tailored for to deal with issues in specific environmental management zones in line with the specific objectives for that particular zone. Policies and legislation that are considered relevant in achieving the objectives of the guidelines are referenced. The relevant competent authorities with the mandate of either enforcing or overseeing the implementation of aspects of the guidelines are also indicated.

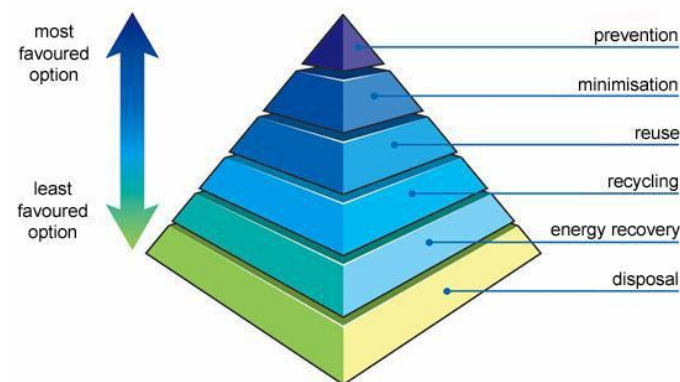
### 7.2. SOLID WASTE MANAGEMENT AND RECYCLING

#### 7.2.1. The need for the guideline

The district is largely rural in nature with a number of small to medium sized towns and a large number of rural villages, especially in the eastern part. While urban centres are relatively well served with formal waste management services, the rural areas tend to rely on informal disposal mechanisms including burning of waste and open pits. The volumes of waste emanating especially from rural residential areas and lodges are significant to the extent that it is becoming a problem to deal with in situ.

#### 7.2.2. Guidelines

Solid waste management that focuses on waste prevention, waste minimisation, reuse, recycling, energy recovery and responsible disposal should become part of the conditions of approval of every new development application in the area.



The following specific steps should be considered when applications are reviewed by authorities:

- Disposal sites must meet the required legal standards and should preferably be shared by users who should collectively be held responsible for its management and maintenance. Dispersion of small sites all over the place should be discouraged. All future and current disposal sites should be inspected and licenced where they meet the legal requirements or be shut where they don't.
- Composting and fermentation projects that generate energy in the form of biogas or heat should be explored and be integrated with "eco-friendly" tourism developments and green production initiatives in the area.
- Recycling, especially recycling of glass, metal and paper should become part of the management of every mine, industry, farm lodge or town in the area. As a form of compensative investment as part of the conditions of approval of developments in across all the zones but particularly in zones 1, 2, 4 and 5 can contribute to a fund that support recycling centres in the district. Recycling centres should be set up at the following places:
  - Vaalwater;
  - Lephalale;
  - Thabazimbi;
  - Modimolle;
  - Bela-Bela;
  - Mokopane; and

- Mokgophong.

- The reuse of materials is difficult and requires planning in terms of the wider consequences of materials that make up packaging etc. Produce containers that can be reused for the same or a different purpose should have preference over containers that are disposed of once the produce is used.
- Efficient use of produce will not only limit costs but will also minimise waste. New development should be planned to make the most efficient use of all continual input requirements such as food, beverages, cleaning liquids, etc.
- Whenever possible the production of waste should be avoided by choosing products and options that does not produce any waste.

### 7.3. SEWAGE DISPOSAL

#### 7.3.1. The need for the guidelines

The disposal of untreated or poorly treated sewage into rivers and drainage streams is a serious concern in the district. This results in the eutrophication of freshwater ecosystems altering the biodiversity pattern and promoting dominance by certain groups of species (i.e. mostly alien biota). Municipal sewage treatment works are generally in an unacceptably poor condition. The need for upgrade and proper management of sewage treatment works has been expressed as a strong concern during the desired state stage. The DWA together with the municipalities are addressing these issue. However some lodges and game farms, particularly, release significant quantities of poorly treated or untreated sewage into the environment. This is also no longer acceptable.

#### 7.3.2. Guidelines

Sewage treatment that focuses on disinfecting and removing organic material from the waste wastewater should become part of the conditions of approval of every new development application in the area that produces effluent.

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The following should be considered when applications are reviewed by authorities:

- The concentration of sewage effluent to enable the use of better and more efficient treatment systems.
- Treatment systems should at least consist of the following components that should be designed by an appropriately qualified engineer or person, or purchased from a recognised and reputable manufacturer of such systems and should as a minimum include:
  - **Primary sewage treatment** in the form of a septic tank to cater for anaerobic digestion and settlement.
  - **Secondary sewage treatment** in the form of a leach field designed to remove organic material which is measured in Biochemical Oxygen Demand (BOD). Sewage high in BOD can deplete oxygen in receiving waters, causing fish kills and ecosystem changes.
- Some commercial systems also provide for a step between primary and secondary treatment biological process are used to reduce the BOD before releasing it into a leach field or using it for irrigation.
- The creation of a wetland before release into a leach field should also be considered, especially in Zones 1 and 2.
- Whatever system is decided on must be able to cater for varying flow levels to ensure that it stays operational during periods when there are low flows and can handle periods where peak season demands or rainfall result in high flow levels.

## 7.4. TRANSFORMATION OF LAND

### 7.4.1. The need for the guidelines

The cumulative effect of the transformation of land in Zones 1, 2 and 9 will over time lead to the depreciation of the natural and production assets that occur in these areas. Given the importance

of the resource base for the sustainable long term development of the area and fact that the EMF have provided for different zones for different types of activities, it is appropriate that transformation of land in Zones 1, 2 and 9 be limited to the extent possible.

### 7.4.2. Guidelines

Developments that transform natural veld or cultivated land into any other cover should only be allowed if such development clearly present conservation, production or tourism advantages that could justify the transformation of land. This must be considered in the review of every application that involves the transformation of land in Zones 1, 2, or 9.

The following should be considered when applications are reviewed by authorities:

- Properties in zones 1 and 2 should not be subdivided. Consolidation of properties should be encouraged whenever possible.
- Development in Zones 1, 2 and 9 should occur in carefully selected clusters that have minimum impact on the natural and scenic values of the area.
- Dispersed development in Zone 1, 2 and 9 should not be allowed.
- Already disturbed areas in Zones 1 and 2 should be considered as the first option for development (the August 2010 Google/Spot images for the areas should be used as the baseline).
- Transformation of land should take the goals and targets of government as reflected in policies, legislation and other documents into account. Relevant legislation and documents include:
  - The National Environmental Management Act, 1998 (Act 107 of 1998) as amended (and its regulations);
  - The Limpopo Environmental management Act, 2003 (Act 7 of 2003);

- The National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004) as amended (and its regulations);
- The National Spatial Biodiversity Assessment, 2004 (and its technical support documents) ;
- The Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) as amended;
- The National Forest Act, 1998 (Act 84 of 1998) as amended; and
- The Municipal Systems Act, 2000 (Act 32 of 2000).

## 7.5. DUTY OF CARE AND REMEDIATION OF ENVIRONMENTAL DAMAGE

### 7.5.1. The need for the guidelines

Chapter 7 of NEMA (Section 28) places a legal responsibility for the rectification of environmental degradation or damage on any parties whose actions may be deemed to have caused such degradation. The parties are obliged to take reasonable steps to either reverse or mitigate the impacts. Depending on the specific impacts, this may entail having to investigate, assess or evaluate the impacts as well as remedying the effects of the pollution or degradation.

Section 28 of NEMA gives environmental authorities powers to enforce the implementation of EMFs. This would include activities that are inconsistent with the objectives of environmental management zones. Within the ambit of EMFs, environmental authorities would be able to issue directives in cases where set guidelines for environmental management zones are not followed.

NEMA gives Environmental Authorities power to give a directive for the rectification of environmental damage, or even undertaking the rectification themselves and claiming compensation from the parties responsible for such environmental degradation.

# Waterberg District Environmental Management Framework Report

## 7.5.2. Guideline

In performing their compliance monitoring and enforcement duties, the relevant national and provincial officials should ensure that any activities that are inconsistent with the objectives of an environmental management zone that are likely to result in pollution and/or environmental degradation, trigger the duty of care mechanism in NEMA and to ensure that such environmental damage is rectified. The August 2010 Google/Spot images for the areas should be used as the baseline.

## 7.6. COMPENSATIVE INVESTMENT

### 7.6.1. The need for the guidelines

The implications of the development pressure on the Waterberg District is that the environmental and society in the district may become net losers as the national economy and society gain benefits. An example of this is tourism facilities that are managed from other provinces and even from overseas which result in minimal cash flows through the local economy and tax regime. Compensative investment may therefore be necessary in certain cases to ensure that the development of the area has equitable local benefits.

Compensative investments can include investments that companies make on capital projects that communities may not have funds to implement. A prime example of this in the Waterberg District is projects where mining companies assist with upgrade of sewage works projects or water purification plants.

Compensative investments may also provide positive social impacts such as skills training, establishment of community centres, funding of community facilities and biodiversity offsets.

### 7.6.2. Guidelines

When applications for new developments are reviewed compensative investments should be considered as mitigation to offset local impacts. The following should be kept in mind:

- Within reason, compensative investments must be regarded as mandatory contributions to society that

developers are obliged to make. This is especially important in the context of the Waterberg District with low levels of employment and a poor skills base. Developers should be forced to invest locally to ensure that a large portion of the profits from development accrues to the local economy or that the development assists in the upliftment of local communities.

- Compensative investment should be considered in every instance where development has a negative impact on local people.
- Compensative investments must not, as an unintended consequence, result in an irreversible or significantly negative change to the character or nature of the area (i.e. the environmental management zones in the case of the EMF).
- Compensative investments must not result in a net loss to society; it must have tangible and measurable benefits to society.
- The purpose of compensative investments must be clearly defined. Compensative investments must not be mistakenly seen as a justification for allowing significantly detrimental impacts to go ahead.
- Compensative investments could enable sectors like mining and energy generation to consider innovative options of investing in social advancement programmes or ecological rehabilitation programmes to improve the character and socio-economic conditions in the district.
- In instances where biodiversity offsets are considered as compensative investment, the guidelines that are already in existence (Western Cape) and those that are currently being drawn up by SANBI should be considered.

## 7.7. STREAM FLOW MANAGEMENT

### 7.7.1. The need for the guideline

The development in the region, but especially the development of the coal field area of Lephalale is very dependant of the availability of enough water. In this context the Mogol River that currently supply almost all the water to Lephalale and the surrounding large scale mining and electricity generation facilities as well as the Crocodile River that is target to augment the water supply in the near future are extremely important. The capacities of these systems must be protected by ensuring that stream flow is not further reduced.

Stream flow is governed by Chapter 4 of the National Water Act, under stream flow reduction activities.

### 7.7.2. Guidelines

As part of the consideration of water augmentation scenarios and schemes, the relevant officials should ensure that:

- Forestry plantations is not allowed in the Water Production Priority Area (Map 32 ).
- Unlicensed farm dams that have proliferated in rivers in the Waterberg District and are inconsistent with the maintenance of the water and the sustainable water production capacity of the Waterberg District should be removed.
- All farm dams issued with registered water use licences to facilitate equitable water allocation and management of water resources.
- No further dams should be allowed in Zones 1, 2 and 9.
- Existing legal dams that prevent adequate stream flow should be modified to increase the flow.

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## 7.8. ERADICATION OF ALIEN VEGETATION

### 7.8.1. The need for the guideline

The uncontrolled spread of invasive alien vegetation presents a threat to natural ecosystems, reduces water production and impacts negatively on the indigenous natural nature of the area.

### 7.8.2. Guideline

Landowners should contribute to programmes such as Working for Water by clearing exotic vegetation from sensitive areas. The following should be considered:

- In order of priority, remove all exotic trees and other exotic vegetation from:
  - Rivers, streams and their natural floodplains;
  - Road reserves and servitudes; and
  - Natural veld where invasion is or has taken place.
- Wood that is generated by the clearing of exotic vegetation can be used as firewood or be processed into compost.
- Eradication initiatives must be followed up regularly to ensure that any regrowth is also removed.

### Dams and agriculture



Photo: D. Jansen van Vuuren

## 8. PUBLIC PARTICIPATION

The aim of the public participation process was to make sure that the stakeholders, interested and affected parties as well as the general public are informed, are able to contribute inputs and to engage in the formal process (commenting on the draft documents).

### 8.1. THE PUBLIC PARTICIPATION PROCESS

Various stakeholders and interested & affected parties were identified during this process. These included the business sector, mining sector, agricultural sector, transport sector, conservation sector, tourism sector as well as the general public.

Three phases of public participation for the Waterberg District EMF were conducted. These included the circulation of the project News and Information Document (Background and Information Document), conducting focus group meetings as well as public open days, and having a review and comment period.

#### 8.1.1. Phase 1

The Project News and Information Document was sent to stakeholders, interested & affected parties as well as the public to inform them of the Waterberg District EMF and its processes. Invitations to the focus group meetings were sent out to the various sectors in the Districts as well as the Local Municipalities' representatives.

#### 8.1.2. Phase 2

During the public open days process invitations were sent to the stakeholders and interested & affected parties. Notices were also advertised in the newspapers (Die Bosvelder, Die Pos and Kwêvoël).

A combined total of 29 meetings were held as focus group meetings and the public open days in 6 different towns in the District during the month of April and June 2010.

The Draft Desired State Report was made available for comments to the stakeholders and interested & affected parties in July 2010.

On 13 September 2010, the stakeholders and interested & affected parties were again invited to submit their comments on

the draft environmental management zones. Invitations were sent via email.

#### 8.1.2.1. Round 1 of the Focus Group Meetings

The first round of focus group meetings were held from 12 April to 15 April 2010.

Eight meetings were held in Lephalale, Vaalwater and Modimolle during this phase. The focus group meetings were structured meetings with individual sectors as well as the Local Municipalities representatives (one-on-one meetings). A questionnaire was used in order to engage the participants in the EMF process as well as to hear their views with regards to the challenges which they are currently encountering in the Waterberg District area. A total of 52 people attended round 1 of the focus group meetings.

A special meeting with Eskom was also held during this phase on 16 April 2010.



Photo: E. Chembeya

#### 8.1.2.2. Round 2 of the Focus Group Meetings and Public Open Days

From 3 June to 9 June 2010, round 2 of the focus group meetings and public open days were held concurrently. The focus group meetings were held in the morning while the Public Open Days were held in the afternoons. A total of 9 meetings were held

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between the two processes, 4 focus group meetings and 5 public open days.

The meetings were held in Modimolle, Vaalwater, Lephalale, Thabazimbi, Mogalakwena and Bela-Bela. A questionnaire and CD of the Draft Status Quo Report was handed out during the two processes and comments on the draft report were invited. A total of 56 people attended the meetings and 21 responses from the questionnaires handed out during the meetings were received. Special meetings were also held with Eskom, Sasol, Telekeshi Ramoshobane Rural Community and the Waterberg District Municipality Planning Forum during this phase.

A summary of the key issues that were identified were:

- Water availability and utilisation
- Water quality and pollution
- Air quality
- Noise
- Character of the Waterberg district
- Waterberg Biosphere Reserve
- Firewood
- Changes to the population structure and socio-economic conditions
- Service infrastructure needs
- Roads
- Telecommunication
- Electricity
- Water and sewerage
- Education and skills training
- Waste disposal
- Government
- Planning and development.

As part of the public participation process, other meetings were held on various aspects of the Waterberg District EMF with different organisation representatives. These included the World Bank, Waterberg Biosphere Reserve Committee, the Department of Transport, the Department of Agriculture, the Department of Water Affairs as well as representatives of the Regional Environmental and Social Assessment project (RESA). These meetings were held in July and August 2010. The main objective of having the meetings was to get a broader and clearer understanding on various issues identified during the process from some of the key players in the area.

Stakeholders and I&APs were informed that the draft report was available on the website address [www.metrogis.co.za](http://www.metrogis.co.za).

A notice was also advertised in the newspapers (Die Bosvelder, Die Pos and Kwêvoël) on 7 and 8 October.

The closing date for comments or inputs was given as 12 November 2010.

# Waterberg District Environmental Management Framework Report

## BIBLIOGRAPHY

- Acocks, J.P.H. 1988. Veld types of South Africa (3rd edn.). Mem. Bot. Surv. S. Afr. No 28. Government printer, Pretoria.
- Arnold, T.H. & De Wet, B.C. (1993). Plants of Southern Africa: names and distribution. Memoirs of the Botanical Survey of South Africa, No. 62.
- Barnes, K.N. (2000). The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.
- Baumann, M. 1919. Ancient tin mines in the Transvaal. Journal of the Chemical and Metallurgical and Mining Society in South Africa. 28.
- Bergh, J.S. (red.) 1998. Geskiedenisatlas van Suid Afrika. Die vier noordelike provinsies. J.L. van Schaik: Pretoria.
- Biemond, W.M. 2002. The Iron Age sequence around a Limpopo river floodplain on Basinghall Farm, Tuli Block, Botswana. Unpublished: University of Pretoria M.A. research proposal.
- Branch, W. R. (1988). South African Red Data Book – Reptiles and Amphibians. South African National Scientific Programmes Report No. 151.
- Breutz, P.L. 1953. The tribes of the Rustenburg and Pilanesberg districts. Pretoria: Government Printer.
- Bruyns, P.V. (2005). Stapeliads of Southern African and Madagascar. Vol 2. Umdaus Press, Hatfield.
- Clarke, K.R. & Warwick, R.M. (1994). Changes in marine communities: An approach to statistical analysis and interpretation. Natural Environmental Research Council, United Kingdom.
- Coetzee C.B. 1976. Delfstowwe van die Republiek van Suid-Afrika. Geologiese Opname. Departement van Mynbou. Pretoria: Die Staatsdrukker.
- Davies, B. & Day, J. (1998). Vanishing Waters. University of Cape Town Press, Cape Town.
- Davis, S.D., Droop, S.J.M., Gregerson, P., Henson, L., Leon, C.J., Vila-Lobos, J.L., Synge, H. & Zantovska, J. (1986). Plants in danger: what do we know? IUCN, Gland.
- De Beer, F. C. 1986. Groepsgebondenheid in die familie-, erf- en opvolgingsreg van die Noord Ndebele. Universiteit van Pretoria: Pretoria.
- Department of Water Affairs and Forestry (DWAF). 2005. A practical field procedure for identification and delineation of wetland and riparian areas. DWAF, Pretoria.
- Dent, M.C., Lynch, S.D. & Schulze, R.E. 1989. Mapping mean annual and other rainfall statistics in southern Africa. Department of Agricultural Engineering, University of Natal. ACRU Report No. 27. Massachusetts: Clark University.
- Dramstad, W.E., Olson, J.D. & Forman, R.T.T. (1996). Landscape Ecology Principles in Landscape Architecture and Land-Use Planning. Harvard University Graduate School of Design, Island Press and the American Society of Landscape Architects.
- Driver, A., Maze, K., Rouget, M., Lombard, A.T., Nel, J., Turpie, J.K., Cowling, R.M., Desmet, P., Goodman, P., Harris, J., Jonas, Z., Reyers, B., Sink, K and Strauss, T. 2005. National Spatial Biodiversity Assessment 2004: priorities for biodiversity conservation in South Africa. Strelitzia 17. South African National Biodiversity Institute, Pretoria.
- Ellmore, V., (August 2010). Landfill Options Restricted. Urban Green File, Volume 15 Number 3.  
<http://www.urbangreen.co.za/index.htm>
- Erasmus, B.P.J. 1995. Oppad in Suid Afrika. 'n Gids tot Suid Afrika, Streek vir Streek. Jonathan Ball Uitgewers Bpk.
- Esterhuysen, A.B. 2008. Ceramic alliance: pottery and the history of the Kekana Ndebele in the old Transvaal. In: Swanepoel, N., Esterhuysen, A. & Bonner, P. (eds). Five hundred years rediscovered: southern African precedents and prospects: 197-214. Johannesburg: Wits University Press.
- Fairbanks, D.H.K., Thompson, M.W., Vink, D.E., Newby, T.S., Van Den Berg, H.M & Everard, D.A. 2000. The South African Land-Cover Characteristics Database: a synopsis of the landscape. S.Afr.J.Science 96: 69-82.
- Friedmann, Y. & Daly, B. (2004). Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG South Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust, South Africa.
- Geiger, S. 2004. Environmental Impact Assessment for the proposed Matimba-Witkop No. 2 transmission line, Limpopo Province. Specialist study. Heritage Impact Assessment. Prepared by Archaeo Info Northern Province for Bholwheki Environmental (Pty) Ltd.
- Germishuizen, G. & Meyer, N.L. (eds.). (2003). Plants of Southern Africa: an annotated checklist. Strelitzia 17, SANBI, Pretoria.
- Germishuizen, G., Meyer, N.L., Steenkamp, Y and Keith, M. (eds.) (2006). A checklist of South African plants. Southern African Botanical Diversity Network Report No. 41, SABONET, Pretoria.
- Golding, J. (2002). Southern African Plant Red Data Lists. South African Botanical Diversity Network Report no 14. SABONET. Pretoria
- Groombridge, B. (ed.) 1994. 1994 IUCN Red List of Threatened Animals. IUCN, Gland, Switzerland.
- Hall, S. 1981. Iron Age sequence and settlement in the Rooiberg, Thabazimbi area. Unpublished MA dissertation. University of the Witwatersrand.
- Hanisc, E.O.M. 1979. Excavations at Icon, Northern Transvaal. South African Archaeological Society (Goodwin Series). 3:72-79.
- Hanski, I. & Cambeford, Y. (1991). Dung beetle ecology. Princeton University Press, Princeton.
- Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds.). (1997). The Atlas of Southern African Birds. Vol. 1 & 2. BirdLife South Africa, Johannesburg.

## Waterberg District Environmental Management Framework Report

- Henderson, L (2001). Alien Weeds and Invasive Plants: a complete guide to declared weeds and invaders in South Africa. ARC Publications. Pretoria.
- Henning, S.F. & Henning, G.A. 1989. South African Red Data Book - Butterflies. South African National Scientific Programmes No. 158, Foundation for Research Development, CSIR, Pretoria.
- Hilton-Taylor, C. (1996). Red Data List of Southern African plants. *Strelitzia* 4. National Botanical Institute, Pretoria.
- Hilton-Taylor, C. (2000). The IUCN/SSC Red List Program: Toward the 2000 IUCN Red List of Threatened Species. *Species* 33: 21-29.
- Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. (eds.) (2005). Roberts – Birds of Southern Africa, VIIIth ed. The Trustees of the John Voelker Bird Book Fund, Cape Town.
- Huffman, T.N. 1990. The Waterberg research of Jan Aukema. *South African Archaeological Bulletin*, 45:117-119.
- Huffman, T.N. & Steel, R. H. 1996 Salvage excavations at Planknek, Potgietersrus. Northern Province. *Southern African Field Archaeology*. 5:5-6.
- Inskeep, R.R. 1978. The peopling of Southern Africa. David Philip: Cape Town.
- IUCN (2001). IUCN Red Data List categories and criteria: Version 3.1. IUCN Species Survival Commission: Gland, Switzerland.
- Jackson, A. O. 1969. The history and political structure of the Mapela Chiefdom of the Potgietersrus district. Unpublished manuscript.
- Jackson, A. O. 1982. The Ndebele of Langa. Ethnological publications no. 54. Department of Co-operation and Development.
- Land Type Survey Staff. 1972 – 2006. Land Types of South Africa: Digital map (1:250 000 scale) and soil inventory databases. ARC-Institute for Soil, Climate and Water, Pretoria.
- Laue, G.B. 2000. Taking stance: posture and meaning in the rock art of the Waterberg, Northern Province South Africa. Unpublished M.Sc. University of the Witwatersrand.
- Laue, G.B. 2001. The rock art of Kurumakatiti Game Reserve. A summary of rock art recording and analysis work conducted in September 2001. Unpublished report. Rock Art Research Institute. University of the Witwatersrand.
- Loubser, J.H.N. 1994. Ndebele archaeology of the Pietersburg area. Unpublished MA dissertation. University of the Witwatersrand.
- Low, A.B. & Rebelo, A.G. (1998) Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs and Tourism, Pretoria.
- MacVicar, C.N. et al. 1977. Soil Classification. A binomial system for South Africa. *Sci. Bull.* 390. Dep. Agric. Tech. Serv., Repub. S. Afr., Pretoria.
- MacVicar, C.N. et al. 1991. Soil Classification. A taxonomic system for South Africa. *Mem. Agric.Nat. Resour. S.Afr.* No.15. Pretoria.
- Mander, M. (1998). The marketing of medicinal plants in South Africa: a case study in KwaZulu-Natal. FAO of the UN, Rome.
- Maquire, J. s..a. A guide to the Makapansgat valley sites.
- Mason, R. J. 1958. New prehistoric paintings in the Brandberg, S.W.A. and the Waterberg, N. *Tvl. Lantern* 7(4):357-368.
- Mason, R. 1962. Prehistory of the Transvaal. Johannesburg: Witwatersrand University Press.
- McCarthy T., Rubidge B. (2005) The Story of Earth & Life A southern African perspective on a 4.6 –billion-year journey. Struik Publishers, Cape Town.
- Mills, G. & Hes, L. 1997. The complete book of southern African mammals. Struik Publishers, Cape Town.
- Minter, L.R., Burger, M., Harrison, J.A., Braack, H.H., Bishop, P.J. & Kloepfer, D. (2004). Atlas and Red data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series #9. Smithsonian Institution, Washington, D.C.
- Moore, M. P. J. 1981. The Iron Age of the Makapan valley area. Unpublished M.A. dissertation. University of the Witwatersrand.
- Mucina, L. & Rutherford, M.C. (eds). (2006). The vegetation map of South Africa, Lesotho and Swaziland. *Strelitzia* 19, South African National Biodiversity Institute.
- Mucina, L. & Rutherford, M.C. and Powrie, I.W. (editors) 2005. Vegetation map of South Africa, Lesotho and Swaziland, 1:1 000 000 SCALE SHEET MAPS South African National Biodiversity Institute, Pretoria.
- Mucina, L., Hoare, D.B., Lötter, M.C., Du Preez, P.J., Rutherford, M.C., Scott-Shaw, C.R., Brednekamp, G.J., Powrie, L.W., Scott, L., Camp, K.G.T, Cillers, S.S., Bezuidenhout, H., Mostert, T.H., Siebert, S.J., Winter, P.J.D., Burrows, J.E., Dobson, L., Ward, R.A., Stalmans, M., Oliver, E.G.H., Siebert, F., Schmidt, E., Kobisi, K., Kose, L. 2006. Grassland Biome. In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.
- Mueller-Dombois, D.S. & Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology. Wiley, New York.
- Naude, M. 1990. Die Transvaalse Boerewoning. *Africana Society of Pretoria* (8): 46-49.
- Naude, M. 2004. Oral evidence on the construction of vernacular farm dwellings in the Waterberg (Limpopo Province). *South African Journal of Cultural History*. 18(1): 34-61
- Partridge, T.C. 1966. Ficus Cave: an Iron Age living site in the central Transvaal. *South African Archaeological Bulletin*. 21:125-132.
- Passmore, N.I. & Carruthers, V.C. (1995) South African Frogs; a complete guide. Southern Book Publishers and Witwatersrand University Press. Johannesburg.
- Pistorius, J.C.C. 1997. Relocation of Langa Ndebele from Ga-Mapela: An assessment of the archaeological potential of the farm Sterkwater (229KR) and proposal for a cultural heritage management programme in the former sphere of influence of the

## Waterberg District Environmental Management Framework Report

Langa-Ndebele chiefdom. Unpublished report for Steffen, Robertson and Kirsten and for Amplats.

Pistorius, J.C.C. 2003 -2006. Various Phase I HIA studies for Eskom's rural power lines on the following farms in the Project Area: Doornhoek 57JQ, Wentzel 342LQ, Mooivallei 342KQ, Haakdongdrift 573KQ, Haakdongdrift 374KQ, Groothoek 278KQ, Ouhoek 345LQ, Leeuwpan 43KQ, Knopieskop 547KQ, Rietfontein 541KQ, Buisdoorns 55KP, Doornhoek 318KQ, Rietfontein 497KQ, Seringhoek 495KQ, Sweet Home 322KQ, Marekeli 437KQ, Patrysvley 58KQ Eensaamheid 376JP, Vaalpenskraal, St Agnes, Kameelnek 278 and Dwars-in-de-Weg.

Pistorius, J.C.C. 2003 -2006. Various Phase I HIA studies for Eskom's rural power lines occurring on the following farms: Rob Roy 64LR, Other World 213LR, St Agnes, Dwars-in-de-Weg 351MR, Rhenosterhoek 609LQ, Groenland 349MR, Baviaanshoek 599LQ, Stinkkraal 195LR, Pic van Teneriffe 470LR, Willowmore 439LR, Rietfontein 45LQ, Grootfontein 501LQ, Boschpoort 551LQ, Witpoort 123LR, Windsor 499LQ, Touwfontein 528LQ, Bloemendal 991LQ, Hamburg 381LR, Boschkop 87IQ, Witfontein 86IQ, and others. Unpublished reports prepared for Eskom, Northern Region.

Pistorius, J.C.C. 2002. A Cultural Heritage Impact Assessment for Eskom's proposed new power line between the Sandsloot Substation and the 400kV transmission line crossing the farm Noord Brabant 774LR in the Limpopo (former Northern) Province of South Africa. Unpublished report prepared for Eskom.

Pistorius, J.C.C. 2002. A Phase II investigation of cultural heritage remains in or near the proposed new open pit for Potgietersrust Platinums Mine (PPRust) on the farm Zwartfontein 818LR in the Limpopo Province of South Africa. Unpublished report for SRK Consulting and the South African Heritage Resources Agency.

Pistorius, J.C.C. 2002. A cultural heritage assessment of Eskom's new Rebone (Gilead) project in the Limpopo (former Northern) Province of South Africa. Unpublished report prepared for Eskom, Pietersburg.

Pistorius, J.C.C. 2002. An archaeological impact assessment study for the proposed new transmission lines between the Sandsloot Substation and the Overysel Substation and between the Witkop Substation and the Overysel Substation in the Northern Province of South Africa. Unpublished report prepared for Eskom.

Pistorius, J.C.C. 2002. A cultural heritage impact assessment for the proposed Overysel Zwartfontein Project. Amendment to Potgietersrust Platinums Ltd's (PPRust) Environmental Management Programme Report (EMPR) Unpublished report prepared for SRK Consulting Engineers.

Pistorius, J. C. C. 2002. A cultural heritage impact assessment for the proposed new open pit for PPRust on the farm Zwartfontein 818LR in the Northern Province of South Africa. Amendment to the PPRust Environmental Management Programme Report (EMPR). Unpublished report prepared for SRK Consulting Engineers.

Pistorius, J.C.C. 2002. A Phase I Heritage Impact Assessment (HIA) report for Eskom's proposed new Alpha Project near Lephalale in the Limpopo Province of South Africa. Unpublished report for Enviro Excellence Services cc.

Pistorius, J.C.C. 2004. A Phase I Heritage Impact Assessment (HIA) study for the proposed new Tambotie Private Game Reserve on the farms Jonkershoek 580LQ and Bellevue 582LQ in the Limpopo Province of South Africa. Unpublished report for Landscape Dynamics.

Pistorius, J.C.C. 2004. A Phase I Heritage Impact Assessment (HIA) study for the proposed new Tambotie Private Game Rererve on the farms Jonkershoek 580LQ and Bellevue 582LQ in the Limpopo Province of South Africa. Unpublished report for Landscape Dynamics

Pistorius, J. C. C. 2004. An extended Phase I Heritage Impact Assessment (HIA) study for PPRust's new Overysel North Open Cast Mine near Mokopane in the Limpopo Province of South Africa. Unpublished report prepared for PPRust Mine.

Pistorius, J.C.C. 2005. A Phase I Heritage Impact Assessment (HIA) study for four eco-type residential developments on the farms Wolmunster 108LQ, Rustenburg 105LQ, New Lands 109LQ and Alpha 103LQ near Lephalale (Ellisras) in the Limpopo Province of South Africa. Unpublished report for Landscape Dynamics

Pistorius, J.C.C. 2005. A Phase I Heritage Impact Assessment (HIA) study for four eco-type residential developments on the farms Wolmunster 108LQ, Rustenburg 105LQ, New Lands 109LQ and Alpha 103LQ near Lephalale (Ellisras) in the Limpopo Province of South Africa. Unpublished report for Landscape Dynamics.

Pistorius, J.C.C. 2005. A Phase I Heritage Impact Assessment (HIA) report for Eskom's proposed new development project involving: Expanding the Vaalwater Substation and building a new proposed 132kV power line between the Vaalwater and Dorset Substation. Unpublished report for Landscape Dynamics.

Pistorius, J.C.C.. 2006. A Phase I Heritage Impact Assessment(HIA) study for a proposed new 132kV power line between the existing Thabazimbi Combined Substation and the proposed new Rooiberg Substation in the Limpopo Province of South Africa. Unpublished report for Eskom Megawattpark. Unpublished report for Enviro Excellent Services cc.

Pistorius, J.C.C. 2006. An extended Phase I heritage Impact Assessment (HIA) study for PPRust's new Overysel North Open Cast Mine near Mokopane in the Limpopo Province of South Africa. Unpublished report prepared for PP Rust.

Pistorius, J.C.C.. 2007. A Phase I Heritage Impact Assessment study for the Eskom Mmamabula Delta Project near Lephalale in the Limpopo Province of South Africa. Unpublished report for Eskom Megawattpark.

Pistorius, J.C.C.. 2007. A Phase I Heritage Impact Assessment study for the Eskom Mmamabula Delta Project near Lephalale in the Limpopo Province of South Africa. Unpublished report for Eskom Megawattpark.

# Waterberg District Environmental Management Framework Report

Pistorius, J.C.C.. 2007. A Phase I Heritage Impact Assessment study for a proposed new 132kV power line running from the new Matlabas Substation to the proposed new Bulge Substation in the Limpopo Province of South Africa. Unpublished report for Landscape Dynamics.

Pistorius, J.C.C.. 2008. A Phase I Heritage Impact Assessment study for the proposed Akanani Exploration/Ventilation Shaft near Mokopane in the Limpopo Province of South Africa. Unpublished report prepared for Golder Associates.

Pistorius, J.C.C.. 2008. A Phase I Heritage Impact Assessment study for the proposed new Akanani Platinum Mine near Mokopane in the Limpopo Province of South Africa. Unpublished report prepared for Golder Associates.

Pistorius, J.C.C.. 2009. A Phase I Heritage Impact Assessment study for Eskom's proposed 132kV power line running between the Bochum Substation and the proposed Knobel Substation in the Limpopo Province of South Africa. Unpublished report for Eskom Northern Region.

Pistorius, J.C.C.. 2009. A Phase I Heritage Impact Assessment study for Eskom's proposed new 132kV power line running between the Waterpoort Substation and the Toulon Substation near Lephalale in the Limpopo Province of South Africa. Unpublished report for Landscape Dynamics and Eskom Northern Region.

Pistorius, J.C.C.. 2009. A Phase I Heritage Impact Assessment study for Eskom's proposed Tilburg Substation and 132kV power line running between the new Tilburg Substation and the existing 132kV Villa Nora/Tom Burke power line north-east of Lephalale in the Limpopo Province of South Africa. Unpublished report for Landscape Dynamics and Eskom Northern Region.

Pistorius, J.C.C.. 2009. A Phase I Heritage Impact Assessment study for Anglo Coal's proposed 37 exploratory gas wells project on the farm Nooitgedacht 403LQ, north-west of Lephalale in the Limpopo Province of South Africa. Unpublished report prepared for Golder Associates.

Roberts J.L, (1998). A Photographic Guide to Minerals, Rocks and Fossils. New Holland Publishers (UK) Ltd.

Roodt, F. E. 2010. Rescue excavations at Tweefontein 915LS, a terminal Late Iron Age settlement near Polokwane, Limpopo Province. Unpublished Honores assignment. Department of Anthropology and Archaeology. University of South Africa.

Rutherford, M.C. & Westfall, R.H. (1994). Biomes of southern Africa: an objective categorization. *Memoirs of the Botanical Survey of South Africa* No. 63.

Rutherford, M.C, Mucina, L., Lötter, M.C., Brednekamp, G.J., Smit, J.H.L., Scott-Shaw, C.R., Hoare, D.B., Goodman, P.S., Bezuidenhout, H., Scott, L., Ellis, F., Powrie, L.W., Siebert, F., Mostert, T.H., Henning, B.J., Venter, C.E., Camp, K.G.T., Siebert, S.J., Matthews, W.S., Burrows, J.E., Dobson, L., Van Rooyen, N., Schmidt, E., Winter, P.J.D., Du Preez, P.J., Ward, R.A., Williamson, S. and Hurter, P.J.H. 2006. Savanna Biome. In: Mucina, L. & Rutherford, M.C. (eds.) *The vegetation of South Africa, Lesotho and Swaziland*. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Skinner, J.D. & Chimimba, C.T. (Revisers). (2005). *Mammals of the Southern African Sub-region*. Cambridge University Press, London.

Skinner, J.D. & Smithers, R.H.N. (1990). *The Mammals of the Southern African Sub-region*. University of Pretoria, Pretoria, RSA.

Tarboton, W. (2001). *A guide to the Nests & Eggs of Southern African Birds*. Struik Publishers, Cape Town.

Threatened Species Programme. (2007). *Interim Red Data List of South African Plant Species*. Produced in collaboration with the National Botanical Institute (NBI), NORAD and the Department of Environmental Affairs and Tourism (DEAT).

Trevor, T.G. 1912. Some observations on ancient mine workings in the Transvaal. *Journal of the Chemical and Metallurgical and Mining Society in South Africa*. 12:267-275.

Van Der Ryst, M. 1998. The Waterberg Plateau in the Northern Province, Republic of South Africa, in the Later Stone Age. *BAR International Series* 715.

Van Der Ryst, M. 1996. The later Stone Age prehistory of the Waterberg, with special reference to Goergap shelter. Unpublished MA thesis. University of the Witwatersrand.

Van Der Ryst, M., Lombard, M., & Biemond, W. 2004. Rocks of potency: engravings, cupules from the Dovedale Ward, southern Tuli Block, Botswana. *South African Archaeological Bulletin*, 59 (179), p1-11.

Van Heerden J., Hurry L., (1998) *Southern Africa's Weather Patterns an introductory guide*. Collegium Educational Publishers, Pretoria. ISBN 0 86817 045 3

Van Ryneveld, K., Van der Walt, J. & Walker, N.J. 2006. The Mmamabula Project – Phase I Archaeological Impact Assessment (AIA): Portion of transmission line routes from Phokoje (Phikwe) and from Mmamabula to Jwaneng, Botswana. Unpublished report to CIC Energy Corporation and Digby Wells Associates.

Van Schalkwyk, J. 1985. Vaalpens: Verwarring en waarheid. *Suid Afrikaanse Tydskrif vir Etnologie*. 8(4), 146-153.

Van Schalkwyk, J. 2005. A Phase Heritage Impact Assessment for Eskom's proposed new Matimba B Power Station near Lephalale in the Limpopo Province of South Africa. Unpublished report prepared for Bholweki Environmental and Eskom Megawatt Park.

Van Warmelo, N. J. 1930. *Transvaal Ndebele texts*. Government Printer: Pretoria.

Van Warmelo, N. J. 1944. *The Ndebele of J. Kekana*. Government Printer: Pretoria.

Van Wyk, A.E. & Smith, G.F. 2001. *Regions of floristic endemism in southern Africa*. Umdaus press, Hatfield.

Van Wyk, B-E, Van Oudtshoorn, B & Gericke, N. (1997). *Medicinal Plants of South Africa*. Briza Publications, Pretoria.

# Waterberg District Environmental Management Framework Report

Viljoen, M.J. & Reinhold, W.U. 1999. An introduction to South Africa's geological and mining heritage. Randburg: Mintek.

Wagner, P.A. & Gordon, H.S. 1929. Further notes on ancient bronze smelters in the Waterberg District. Transvaal. South African Journal of Science. 26:263-575.

Wood, J., Low, A.B., Donaldson, J.S., & Rebelo, A.G. (1994). Threats to plant species through urbanisation and habitat fragmentation in the Cape Metropolitan Area, South Africa. In: Huntley, B.J. (Ed.) Botanical Diversity in Southern Africa. National Botanical Institute, Pretoria.

## RESOURCE DOCUMENTS

These are documents that were consulted in order to form a perspective of the study area and the issues that affect it. It is listed here as it may also be of interest to readers of the EMF Report. Documents that are in electronic format without copyright conditions will be included on the DVD of the Final EMF Report.

### SPATIAL DEVELOPMENT FRAMEWORKS AND INTEGRATED DEVELOPMENT PLANS

Waterberg District Municipality. (April 2009) *Waterberg Spatial Development Framework (SDF) 2009 Final Draft*. The Development Partnership

Waterberg District Municipality. (2008/9). *Waterberg Integrated Development Plan (IDP)*

Bela-Bela Local Municipality. (November 2009). *Bela-Bela Spatial Development Framework (SDF)*. Pieterse, Du Toit & Associates CC.

Bela-Bela Local Municipality, (May 2009) *Integrated Development Plan (IDP) Review 2009/10 Adopted IDP*: May 2009.

Lephalale Local Municipality. (2009). *Lephalale Spatial Development Framework (SDF)*. Management & Development Strategies.

Lephalale Local Municipality. (2010/11) *Lephalale Integrated Development Plan (IDP)*.

Modimolle Local Municipality. (2010). *Modimolle Spatial Development Framework (SDF)*.

Modimolle Local Municipality. (2009). *Integrated Development Plan (IDP) 2009/10 Analysis 1*.

Mogalakwena Local Municipality. (February 2009) *Spatial Development Framework (Final Draft Report)*. The Development Partnership.

Mogalakwena Local Municipality. (2009/10). *Integrated Development Plan (IDP)*.

Mookgophong Local Municipality. (2010/11). *Integrated Development Plan (IDP)*.

Mookgophong Local Municipality. (February 2010). *Spatial Development Framework (SDF)*. The Development Partnership. Hard Copy Only

Thabazimbi Local Municipality. (June 2008). *Integrated Spatial Development Framework*. Plan Wize Town and Regional Planners.

Thabazimbi Local Municipality. *Integrated Development Plan (IDP) 08/09 Final Document*.

### LEGISLATION

The following pieces of national legislation were reviewed:

Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983), as amended;

Development Facilitation Act, 1995 (Act 67 of 1995), as amended and taking recent judgments in respect to chapters 5 and 6 into account;

Electricity Regulation Act, 2006 (Act 4 of 2006);

Environment Conservation Act, 1989. (Act No 73 of 1989);

Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003);

National Environmental Management Act, 1998 (Act 107 of 1998), as amended;

National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004);

National Forests Act, 1998 (Act No. 84 of 1998); and

National Water Act, 1998 (Act 36 of 1998), as amended.

### WORLD BANK STANDARDS

International Finance Corporation - World Bank Group. (April 2007) Environmental Health and Safety General Guidelines (an Introduction).

International Finance Corporation - World Bank Group. (April 2007) Environmental Health and Safety Guidelines for Base Smelting and Refining.

International Finance Corporation - World Bank Group. (April 2007) Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution.

International Finance Corporation - World Bank Group. (April 2007) Environmental, Health, and Safety Guidelines for Foundries.

International Finance Corporation - World Bank Group. (April 2007) Environmental Health and Safety Guidelines for integrated steel mills.

International Finance Corporation - World Bank Group. (April 2007) Environmental Health and Safety Guidelines for Large 20. Volume Petroleum-based Organic Chemicals Manufacturing.

International Finance Corporation - World Bank Group. (December 2007) Environmental Health and Safety Guidelines for Large Volume Inorganic Compounds Manufacturing and Coal Tar Distillation.

International Finance Corporation - World Bank Group. (December 2007) Environmental Health and Safety Guidelines for Mining.

# Waterberg District Environmental Management Framework Report

International Finance Corporation - World Bank Group. (April 2007) Environmental Health and Safety Guidelines for Petroleum Refining.

International Finance Corporation - World Bank Group. (December 2008). Environmental, Health and Safety Guidelines for Thermal Power Plants.

International Finance Corporation - World Bank Group. (April 2007) Environmental Health and Safety Guidelines for Wind Energy.

## GOVERNMENT DOCUMENTS

DEA&DP (2009) Guideline on Transitional Arrangements, NEMA EIA Regulations Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP).

Department of Minerals and Energy. Energy Security Master Plan - Electricity 2007-2025. Republic of South Africa.

Department of Water Affairs (2009) Green Drop Report South African Waste Water Quality Management Performance. Republic of South Africa

Department of Water Affairs and Forestry, South Africa. 2004. Internal Strategic Perspective: Limpopo Water Management Area : Prepared by Goba Moahloli Keeve Steyn (Pty) Ltd, in association with Tlou & Matji (Pty) Ltd and Golder Associates (Pty) Ltd. on behalf of the Directorate: National Water Resource Planning. Report No. P WMA 01/000/00/0304.

Government Gazette (8 October 2010) Vol. 544 No. 33600. Waterberg Priority Area Declaration. Government Printing Works. Pretoria

Oelfse S., Turton A. CSIR Natural Resources and the Environment for the Department of Environmental Affairs and Tourism. (March 2008) Emerging Issues Paper: Mine Water Pollution. ISBN NO: 978-0-9814178-5-1

River Health Programme (2007) A Biomonitoring Survey of the Lephhalala River Catchment Limpopo Province Field Survey of 2005. M.K. Angliss. Specialist Scientist. Limpopo Environmental Affairs.

River Health Programme (2005). State-of-Rivers Report: Monitoring and Managing the Ecological State of Rivers in the Crocodile (West) Marico Water Management Area. Department of Environmental Affairs and Tourism. Pretoria. ISBN NO: 0-620-34054-1

River Health Programme (2006) State-of-Rivers Report The Mokolo River System. Department of Environmental Affairs and Tourism. Pretoria. ISBN No. 978-0-620-38215-1.

Waterberg Municipality. (August 2005). Agricultural Development Strategy Report 1: Status Quo, Policy Analysis and Opportunity Identification (Draft for Discussion). Modimolle.

Waterberg District Municipality. (June 2009). Waterberg District Municipality Air Quality Management Plan. Gondwana Environmental Solutions

Waterberg District Municipality. (September 2006). Environmental Management Plan for the Waterberg District Municipality. HC Hluli Environmental Consultants and Engineers

## OTHER DOCUMENTS

Annex A, International Environmental Guidelines  
[http://www.trimmforum.de/trimm/webinfo.nsf/89ac9f3e554f9843c1256caa003d74e4/eee3663df5146d6dc12570e000532006/\\$FILE/Annex%20A.pdf](http://www.trimmforum.de/trimm/webinfo.nsf/89ac9f3e554f9843c1256caa003d74e4/eee3663df5146d6dc12570e000532006/$FILE/Annex%20A.pdf) 2010-04-26

Convention on Biological Diversity. Signed 1993 and ratified 2 November 1995.

De Klerk, A. (2003). The context of the Waterberg - Chap 2.

De Klerk, A. (2003). The Waterberg Biosphere Reserve - Chap 3.

Equator Principles. A financial industrial benchmark for determining, assessing and managing social & environmental risk in project financing. (July 2006) [www.equator-principles.com](http://www.equator-principles.com)

Eskom. (October 2008). Environmental Impact Assessment for the two proposed coal-fired power-stations in the Waterberg area (Limpopo) DEAT Ref No 12/12/20/1255 - Draft minutes of the Authority Focus Group Meeting. Lephhalale.

Eskom. (2005) Environmental Scoping Report for the proposed establishment of a New Coal-Fired Power Station in the Lephhalale Area, Limpopo Province 18/11/2005. Web.  
<http://www.eskom.co.za/content/MatESSCh05GenDescr.pdf> 2009/12/28

Food and Agriculture Organization of the United Nations Sub-regional Office for Southern and East Africa Harare. (2004). Drought impact mitigation and prevention in the Limpopo River Basin. Rome, Italy.

Fourie C J S., Henry G., CSIR (July 2009) New airborne geophysical data from the Waterberg Coalfield.

Mara I., Pressend M., Group for Environmental Monitoring (August 2001) Policy Brief: Mining, Environment and Sustainable Development.

Sasol Stakeholder Dialogue, Sasol Rosebank – 11 September 2008, Record of the Meeting.  
[http://sasolsdr.investoreports.com/sasol\\_sdr\\_2008/downloads/site\\_reports/External\\_Stakeholder\\_Dialogue.pdf](http://sasolsdr.investoreports.com/sasol_sdr_2008/downloads/site_reports/External_Stakeholder_Dialogue.pdf) 2010-04-26

Sasol. Update from Chief Financial Officer. (January 2009)  
[http://www.sasol.com/sasol\\_internet/downloads/CFO\\_newsletter\\_to\\_investors\\_29January2009\\_final\\_1233237538178.pdf](http://www.sasol.com/sasol_internet/downloads/CFO_newsletter_to_investors_29January2009_final_1233237538178.pdf) 2010-04-26

Sasol. Update from Chief Financial Officer. (June 2009)  
[http://www.sasol.com/sasol\\_internet/downloads/CFO\\_newsletter\\_to\\_investors\\_30June2009\\_final\\_1246367964853.pdf](http://www.sasol.com/sasol_internet/downloads/CFO_newsletter_to_investors_30June2009_final_1246367964853.pdf) 2010-04-26

Stephen Greenberg. Agricultural Trade and Food Security, The dangers of International Trade.  
[www.waterberg.gov.za/docs/agriculture/food/foodsec1.doc](http://www.waterberg.gov.za/docs/agriculture/food/foodsec1.doc) 2009/11/06.

# Waterberg District Environmental Management Framework Report

Sustainable Energy News on Email (SENSE) Number 46 (August 2007) <http://www.earthlife.org.za/wordpress/wp-content/uploads/2009/02/sense-46-august-07.pdf> 2010-04-26

Waterberg Nature Conservancy Newsletter, Number 5, January 2009.

Wright, C. (Research Group Leader / Senior Researcher). (2010). Focus on CSIR Research in Environmental Health. Discussion document for AQ managers: Putting health on the agenda for air quality management. CSIR Natural Resources and the Environment. Pretoria.

## INTERNET ARTICLES AND WEB PAGES

Aviva Corporation Limited. (2007) Mmamantswe Coal Project. <http://www.avivacorp.com.au/?id=211> 2010-04-26

Carnie T., (March 2010) Sour taste over Eskom's 'sweetheart' deals. The Mercury, IOL. [http://www.iol.co.za/general/news/newsprint.php?art\\_id=vn20100318073521496C224596&sf](http://www.iol.co.za/general/news/newsprint.php?art_id=vn20100318073521496C224596&sf) 2010-04-26

Carte D., (September 2009) Wary Sasol scales back. Moneyweb. <http://www.moneyweb.co.za/mw/view/mw/en/page292520?oid=317803&sn=2009+Detail&pid=295165> 2010-04-26

Creamer M., (September 2009) Sasol chooses Limpopo coal for Mafutha CTL project. Mining Weekly. <http://www.miningweekly.com/article/sasol-chooses-limpopo-coal-for-mafutha-ctl-project-2008-09-08> 2010-04-26

Creamer M., (December 2009) Exxaro's R9bn Medupi coal expansion project at Grootegeluk. Mining Weekly. <http://www.miningweekly.com/article/exxaros-r9bn-medupi-coal-expansion-project-at-grootegeluk-2009-12-11> 2010-04-26

de Lange J., (March 2010) Eskom taken to court. Fin24.com [http://www.fin24.com/articles/default/display\\_article.aspx?ArticleId=1518-1786\\_2576368](http://www.fin24.com/articles/default/display_article.aspx?ArticleId=1518-1786_2576368) 2010-04-26

Engineering News. (November 2006) Sasol expansion proposed. Creamer Media's Engineering News.

<http://www.busrep.co.za/index.php?fArticleId=3518383&fSectionId=552&fSetId=662> 2010-04-26

Komen H., (February 2010) Objection to coal mine near Mapungubwe World Heritage Site. EWT media release. <https://www.ewt.org.za/FORYOU/LatestNews/tabid/85/EntryId/2/OBJECTION-TO-COAL-MINE-NEAR-MAPUNGUBWE-WORLD-HERITAGE-SITE.aspx> 2010-04-26

McKay D., Monteiro J., (March 2009) Sasol: Major projects not imperilled. Fin24.com. [http://www.fin24.com/articles/default/display\\_article.aspx?ArticleId=1518-21\\_2482294](http://www.fin24.com/articles/default/display_article.aspx?ArticleId=1518-21_2482294) 2010-04-26

Mining Review Africa. Issue 6. Botswana on the cusp of massive coal project. [http://papers.ssrn.com/sol3/Delivery.cfm/SSRN\\_ID1099949\\_code839014.pdf?abstractid=1099949&mirid=1](http://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID1099949_code839014.pdf?abstractid=1099949&mirid=1) 2010-04-26

Naidu E., (August 2007) Eco-threat to the Waterberg. Sunday Independent <http://www.sundayindependent.co.za/index.php?fArticleId=3990745> 2010-04-26

Ndaba D. (March 2008). Abundant Waterberg coalfields capable of hosting many more power stations. Mining Weekly Online, Creamer Media. <http://www.miningweekly.com/article/abundant-waterberg-coalfield-capable-of-hosting-many-more-power-stations-2008-03-20> 2010-04-28

Pringle C. SA launches air quality information system. Engineering News. <http://www.engineeringnews.co.za/article/sa-launches-air-quality-information-system-2010-03-23> 2010-04-26

Rawoot I., (January 2010) Electricity and water don't mix. Mail & Guardian Online <http://www.mg.co.za/article/2010-01-27-electricity-and-water-dont-mix> 2010-04-26

Reuters. (November 2009) Exxaro to exploit coal reserves in Waterberg. Mail & Guardian Online. <http://www.mg.co.za/article/2009-11-04-exxaro-to-exploit-coal-reserves-in-waterberg> 2010-04-26

Ryan B., (July 2006) Anglo Coal cautious on Waterberg methane. Miningmx.com <http://www.miningmx.com/news/energy/734058.htm> 2010-04-26

Ryan B., (February 2008) Coal projects being stoked up in Botswana. Miningmx.com <http://www.miningmx.com/energy/905329.htm> 2010-04-26

Ryan B., (January 2010) Decision time looms at AngloPlat. Miningmx.com <http://www.miningmx.com/opinion/columnists/brendan-ryan/381945.htm> 2010-04-26

Ryan B., (February 2009) Exxaro looks at new coal mine. Miningmx.com. [http://www.miningmx.com/mining\\_fin/exxaro-looks-at-new-mine.htm](http://www.miningmx.com/mining_fin/exxaro-looks-at-new-mine.htm) 2010-04-26

Ryan B., (February 2010) Exxaro targets iron ore. Miningmx.com [http://www.miningmx.com/special\\_reports/conf\\_cover/2010/mining-indaba-2010/exxaro-targets-iron-ore.htm](http://www.miningmx.com/special_reports/conf_cover/2010/mining-indaba-2010/exxaro-targets-iron-ore.htm) 2010-04-26

Schneider M. for Financial Mail. (March 2007) Mining Power-fuelled potential. Web <http://free.financialmail.co.za/report07/limpopo/dlimpopo.htm>

Seccombe A., (November 2007) Scharrig plans large Botswana coal project. <http://www.miningmx.com/energy/681129.htm> 2010-04-26

Shirley B. for Engineering News (March 2009) Power stations pose risk to Waterberg water quality. Web. <http://www.engineeringnews.co.za/article/scientist-assesses-the-effects-of-power-stations-on-water-sources-2009-03-13>. 2009-11-06

Webb M. for Engineering News. (September 2007) Sasol considers Free State, Waterberg sites for new coal-to-liquids plant. Web. <http://www.engineeringnews.co.za/article/sasol-considers-free-state-waterberg-sites-for-new-coaltoliquids-plant-2007-09-10-1>. 2009-11-06

# Waterberg District Environmental Management Framework Report

Williams F., (February 2010) Firms to ditch Gauteng. Fin24.com  
[http://www.fin24.com/articles/default/display\\_article.aspx?ArticleId=1518-1786\\_2573107](http://www.fin24.com/articles/default/display_article.aspx?ArticleId=1518-1786_2573107) 2010-04-26

## **PRESENTATIONS**

Eskom. van Niekerk C. Eskom Power Generation – the way forward: Presentation by Eskom on the Matimba Future. Web.  
<http://www.lephalale.com/documents/Matimba%20Future.ppt>  
2006/11/06

Sasol. Swart Q. (March 2009) Project Mafutha Presentation to LEDET. Web.  
<http://www.limpopobizzone.gov.za/docs/SASOL%20Presentation%20to%20LEDET%2023%20March%202009.PPT> 2009/11/06

Venter E., General Manager Kumba Coal (May 2005) Status of Waterberg Coal development plan, Presentation at the Lephalale LED Summit Lephalale. Web.  
<http://www.lephalale.com/documents/Waterberg%20-%20Lephalale-%20May2005.ppt> 2009/11/06

## **SPECIALIST REPORTS**

Hoare, D. (May 2010). Biological receiving environment of the Waterberg District Municipality, Limpopo Province. David Hoare Consulting cc. Pretoria

Pistorius, J. (May 2010). History of the Waterberg District.

van der Waals, J.H. Zhou, N. (2010) Status Quo Report, Soil & Agriculture, Waterberg District. Terra Soil Science.

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