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ENVIRONMENTAL MANAGEMENT FRAMEWORK AND STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN



METSWEDING DISTRICT MUNICIPALITY



May 2011

A Report for: Metsweding District Municipality



ENGINEERS AND ENVIRONMENTAL CONSULTANTS

Linking **People**. Promoting **Growth**.

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MAP 1: ENVIRONMENTAL MANAGEMENT ZONES

ABBREVIATIONS AND ACRONYMS

AMD	Acid Mine Drainage
AIDS	Acquired Immunodeficiency Syndrome
ARC	Agricultural Research Council
BIMS	Biodiversity Information Management System
CBA	Critical Biodiversity Area
CBD	Central Business District
CBO	Community Based Organisation
CCP	Cities against Climate Change Programme
CFL	Compact Fluorescent Lamp
CoT	City of Tshwane
DEA	Department of Environmental Affairs
DTI	Department of Trade & Industry
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
GDA&RD	Gauteng Department of Agriculture and Rural Development
GDP	Gross Domestic Product
GVA	Gross Value Added
GIS	Geographic Information System
HIV	Human Immunodeficiency Virus
HSP	Housing Sector Plan
I&AP	Interested & Affected Parties
ICCC	International Climate Change Conference
ICLEI	ICLEI-Local Governments for Sustainability (formerly International Council for Local Environmental Initiatives)
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IEP	Integrated Environmental Plan
ITP	Integrated Transport Plan
IUCN	International Union for the Conservation of Nature
LED	Local Economic Development
MDM	Metsweding District Municipality
MEC	Member of the Executive Council
MIG	Municipal Infrastructure Grant
MOSS	Municipal Open Space System
NEMA	National Environmental Management Act
NGDB	National Groundwater Database
NGO	Non-Governmental Organisation
NSBA	National Spatial Biodiversity Assessment
PSDF	Provincial Spatial Development Framework
QDS	Quarter Degree Square
RDP	Reconstruction and Development Programme
SANBI	South African National Biodiversity Institute
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SEMP	Strategic Environmental Management Plan
SoER	State of Environment Report
SWOT	Strength, Weakness, Opportunities & Threats
WMA	Water Management Area

Executive Summary

The Metsweding District Municipality is an area within the Gauteng province experiencing growth and development pressure. Pressure factors include urban development and expansion, a backlog in infrastructure provision, demand for housing, and urbanisation.

The Metsweding District Municipality can be described as a transition zone located between the City of Tshwane urban metropolitan area and the rural areas of the Mpumalanga province. There is an intensification of development towards the west of the District in the areas that border the City of Tshwane. The most important **functional regional linkage** is therefore with the City of Tshwane (and to a lesser extent the Ekurhuleni Metropolitan Municipality), with a considerable amount of urban development spilling across from the City of Tshwane municipal area into the western parts of Metsweding, namely Kungwini West.

The Metsweding District is largely rural in character, with approximately 95% of the area comprising typical rural land uses and activities such as nature areas, ecological features, conservation areas, farming and cultivation, rural residential and non-productive farm portions/vacant land. The District has a significant but underdeveloped agricultural base.

The formulation of the **Environmental Management Framework** for Metsweding is therefore necessary to ensure that development and growth is sustainable and does not take place to the detriment of the sustainability of the natural resource base.

In essence, the Environmental Management Framework defines a spatial development structure that can be supported by the natural resource base and which most closely matches the social and developmental desires of the local communities. The environmental management framework consists of an analysis of both the current and desired states of the biophysical and socio-economic environments, and a spatial interpretation of management actions that are required to reach the desired state of environment in the Metsweding District Municipality.

The **Status Quo Assessment** highlights the fact that the area has a high natural resource quality in terms of species richness due to the convergence of various biomes. Unfortunately, habitats in the central and southern parts of the study area are rapidly degrading due to large scale agricultural activities, urban expansion, mining and land transformation, especially the remaining untransformed fragments of Rand Highveld Grassland and Central Sandy Bushveld.

Most of the activities in Metsweding centre around the towns of Cullinan, Rayton and Bronkhorstspruit and associated townships, with agriculture and mining being the most prevalent activities. The development of the Roodeplaat and Bronkhorstspruit Dams, Dinokeng Game Reserve and the rich cultural history in the Cullinan area have resulted in an increase in local tourism activities. Transformation of the natural environment is linked to these land use activities as well as continued urban growth.

The levels of land transformation from natural conditions have been high and there have been biodiversity losses as a result. The highest impacts have been on the grassland areas as well as within the freshwater ecosystems. Information on red data species and critical biodiversity areas exists which should be used to inform environmental management in the municipality.

The areas that have a **high ecological or biodiversity value** are: ridges and mountains as a high proportion of the threatened and near threatened priority plant species in the study area occur within this habitat; vegetation of high conservation importance as this area contains a vegetation type of elevated conservation value. In general, these areas have been transformed to a high degree and remaining natural habitat needs to be conserved in order to retain components of these ecosystems and its biodiversity in the landscape. There are some threatened organisms that occur within this area which also require protection; and thirdly rivers and drainage lines: the main perennial rivers draining the study area are important hydrological features in the landscape and also provide vital ecological corridors through the landscape.

The **main threats** to the natural environment in Metsweding are related to pressures on natural

resource base amidst development and expansion of the urban areas, as well as extra-urban agricultural and mining extensions. An important step to managing these issues is the recognition of the value of wetlands and watercourses, as well as their associated aquatic ecosystems must form part of the development planning of both the urban and rural areas of Metsweding.

During the **Desired State phase** environmental specialists are responsible for the assessment and integration of information into intermediate elements (feature descriptions, feature status, feature objectives, etc.) that feed into the GIS system and ultimately a Desired State analysis. The desired state phase provides a description of the desired state of the Metsweding area given all the available information and inputs.

The Desired State information feeds into the final Environmental Management Framework via the designation of environmental management zones and the compilation of a Strategic Environmental Management Plan.

The delineation of **management zones** compares the various layers of 'status quo' and 'desired state' information to highlight specific points or areas of convergence between land uses or particular features that retain a high resource value. Seven management zones are identified for the area, namely:

1. Dinokeng Game Reserve Zone
2. Dinokeng Rural and Rangeland Zone
3. Rural Zone
4. Agriculture Zone
5. Development Corridors & Urban Consolidation Areas
6. Recreation Zone
7. Biodiversity Zone

The management zones will be managed according to the directions of a **strategic environmental management plan**, which outline general management requirements, compatible and incompatible land uses, roles and responsibilities, as well as guidance on the necessary institutional structures for each zone.

Specific **environmental objectives** that will be pursued in the implementation of the environmental management plan are:

- No net loss of ecosystem function, and maintaining the resilience of critical and sensitive environments;
- Integrated services planning;
- Environmental sustainability in design; and
- Community-based, tourism-led development focus.

In addition, the **SEMP** provides recommendations on how to manage issues that will be common to all the management zones such as mining, subdivision, the presence of ecological or social sensitivities and the need for appropriate regulatory and monitoring institutions.

A particularly important consideration in terms of regulatory structures is the impending **incorporation of the Metsweding area into the municipal jurisdiction of the City of Tshwane**. This realignment of municipal responsibility will facilitate better management of natural resources that were previously divided across different administrative areas. It should also ensure that issues of poorly controlled urban growth around the Silver Lakes and Rietvlei Dam area is better managed.

1 INTRODUCTION

SSI Environmental was appointed by Metsweding District Municipality (MDM) to develop an Environmental Management Framework for the Metsweding District Municipality. An Environmental Management Framework (EMF) for the Metsweding District Municipality will be crucial in guiding sustainable land use development within the District. The EMF will provide a tool to ensure that sustainable development within important identified geographical areas takes place. The ultimate goal is to ensure that water resources, biodiversity and associated ecosystem services of the various biomes are sustained and secured for the benefit of current and future generations. Crucially, SSI Environmental was the lead consultant for the completed Dinokeng Project EMF, which is one of the fundamental building blocks and sources of information for the broader Metsweding EMF. This provides us with an intimate knowledge of a portion of the study area and a sound platform to develop a comprehensive and user-friendly EMF for Metsweding Municipal Area.

The environment in which we live is dynamic and is continuously changing over time. This environment comprises resources, economic, political, social and physical characteristics. Development, urbanisation and population expansion are the main driver of degradation of the earth's natural environment and resources. In recent years there have been a movement towards better management of the environment and natural resources with the announcement of protocols and conventions, including the Kyoto Protocol and the International Climate Change Conference (IPCC).

South Africa proclaimed the National Environmental Management Act (Act No 107 of 1998), which creates the legislative context for the management of South Africa's physical environment and ecological resources.

1.1 Metsweding District Municipality

Metsweding District Municipality (MDM) consists of two local municipalities namely: Kungwini Local Municipality and Nokeng Tsa Taemane Local Municipality. MDM's main urban centres include Rayton, Cullinan, Refilwe, Rethabiseng, Roodeplaar, Ekandustria, Ekangala, Silverlakes, Zithobeni and Bronkhorstspuit.

MDM has a very small economy which is mainly driven by the manufacturing industry. The District contributes less than 2% to Gauteng's Gross Domestic Product (GDP). Other opportunities for economic growth are available in agriculture, mining, and tourism.

A number of key drivers have been identified as a threat to the natural environment of MDM:

- Mining activities
- Urban sprawl and development pressures
- Informal settlements
- Illegal industrial activities
- Alien vegetation and degraded lands

The significance of these drivers is a function of the level of human activities and the technology applied. The fundamental premise of sustainable development is integration of environmental factors into development policies, programmes and projects within a strategic environmental framework.

1.2 Rationale for Metsweding Project

The aim of this project is to develop an Environmental Management Framework to improve the integration of biodiversity into land use planning and decision making through a combination of activities including:

- engaging in institutional co-ordination mechanisms;
- providing accurate, relevant information and materials;
- providing appropriate training and targeted awareness raising; and
- facilitating one-on-one follow up and support and also to guide future land use and development within the municipality.

The integrative, multi-disciplinary nature of sustainable development necessitates that co-ordinated efforts are undertaken across different policy sectors to ensure that the goals of development over time are achieved in those sectors. This entails systematic and continuous processes of information generation, policy and implementation monitoring, as well as the evaluation of the sustainability of development. The sectors concerned include the three traditional vertical pillars of sustainability, namely social, economic and environmental sectors, embedded in a horizontal layer of good governance that enables the achievement of durability over time. Therefore, an EMF for Metsweding is important as a foundation for the Integrated Development Planning (IDP) cycle and municipal Spatial Development Framework (SDF) process.

1.3 Understanding the Scope of Work

An EMF is the integration of spatially represented information connected to parameters, such as ecology, hydrology, infrastructure and services. The main purpose of an EMF is to pro-actively identify areas of potential conflict between development proposals and critical/ sensitive environments.

Factors playing a major role in the development of the EMF are the acquisition of data, comments from all sectors that have and may receive positive or negative effects from the development and lastly all inputs and use of future development plans for the study area. All aspects must be in line and complement each other rather than have separate studies for each area of the municipality.

The Metsweding Spatial Development Framework (SDF 2006) is the spatial representation of the Integrated Development Plan (IDP) process which plays a major role in the planning, development and implementing of any future development and growth of a municipality. The SDF and IDP focus on the importance of service delivery in a municipality as well as development trends within the municipal area, and are therefore a key starting point for the EMF. The full extent of the District Municipality forms the study area for the Environmental Management Framework.

1.4 Metsweding Project Objectives

Environmental Management Frameworks are spatially referenced compendiums of social and biophysical environmental information regarding the particular study area. They generally aim to consolidate environmental knowledge from various sources into a more accessible form that can be integrated into other planning processes.

As a form of strategic environmental assessment or planning, these frameworks can:

- Allow for a wider consideration of impacts and alternatives;
- Be used as a pro-active tool to support the formulation of strategic action plans for sustainable development;
- Increase the efficiency of tiered decision making (including strengthening of project-level EIA);

- Allow for a systematic and effective consideration of the environment at higher tiers of decision making; and
- Improve consultation with and participation by the public.

1.5 Summary of the Metsweding Situational Assessment

1.5.1 Location of the Municipality

The Metsweding District Municipality is situated on the north eastern part of Gauteng Province. The district municipality consists of two local municipalities namely: Kungwini and Nokeng Tsa Taemane.

Metsweding District Municipality spans over an area of approximately 4062.87 km² which amounts to 26.6% of the total area of Gauteng province (MDM, 2010). MDM is bordered by:

- Nkangala District Municipality (Mpumalanga Province) to the east
- Waterberg District Municipality (Limpopo Province) to the North
- City of Tshwane Metropolitan Municipality (Gauteng Province) to the West

The main urban centres of MDM include Rayton, Cullinan, Refilwe, Rethabiseng, Roodeplaat, Ekandustria, Ekangala, Silverlakes, Zithobeni and Bronkhorstspuit.

1.5.2 History and Background

MDM was established on 5 December 2000 as a Category C cross-boundary municipality as per Notice 6767 of 2000 as published in the provincial gazette extraordinary No. 141 of 01 October 2000, in terms of Section 12 of the Municipal Structures Act, Act No. 117 of 1998. Kungwini and Nokeng Tsa Taemane comprise the local municipalities under Metsweding and are classified as category B municipalities.

Historically, Metsweding is the place where South Africa's biggest diamond was discovered. Additionally it is rich in culture and the Tswana, Ndebele, Pedi and Tsonga speaking communities can trace their origin back to Metsweding. There are about 20 cultural and heritage sites in Nokeng municipality and about 8 sites in Kungwini municipality.

1.5.3 Demographic Profile

The 2001 Census by Statistics SA established that MDM has a population of roughly 162,268 people with Kungwini municipality comprising of approximately 109,065 and Nokeng municipality comprising 53,205 people.

In 2007, Nokeng Tsa Taemane local municipality had the least population in Gauteng province and notably, the population of Metsweding had decreased from 2001 by 5.4 % and stood at 153,539. This population is now anticipated to have risen by 2% which is the annual district population growth rate. Therefore, from these statistics, it can be approximated that the 2010 population of MDM is 194,721. The majority of the population in MDM is concentrated in Kungwini local municipality, specifically in Bronkhorstspuit, Refilwe/Cullinan town, Rayton town, Zithobeni and Ekangala townships.

The 2001 census and the 2007 community survey revealed that a majority (70%) of the population in MDM live in formal dwellings while 20% live in informal dwellings.

1.5.4 Social Environment

MDM has a variety of infrastructure which includes:

- primary health care clinics
- lower and upper primary and high schools

- libraries
- community centres
- fire and rescue services
- one private district hospital in Bronkhorstspuit

Most of the facilities are predominantly in Kungwini local municipality.

1.5.5 *Socio-Economic Environment*

Metsweding municipality is challenged by high unemployment rates and low skills among the labour force. This is worsened by limited economic and working opportunities in the district and the migration of skilled workforce to bigger metropolitan cities. This has the net effect of a population with low levels of disposable income and thereby, reducing buying capacity which is an economic stimulant.

The manufacturing sector is MDM's economic backbone although the recent global economic recession has made the economic situation bleak. The major economic activities of manufacturing and government services are mainly concentrated in Kungwini municipality thus forming a skewed distribution among the population.

1.5.6 *Terrain*

Metsweding consists of undulating topography, generally flattest in the north. Occasional steeper, rocky ridges occur in the south of Nokeng and in the south-west of Kungwini. The terrain class according to Kruger (1983) comprises mainly "Plains with moderate relief" with a small area of "Plains with low relief" in the far north and an area of "Lowlands with parallel hills" in the south-west. The altitude above sea level falls from around 1 550 m in the far south to as low as 950 m in the extreme north-east.

The area is drained by several small rivers, many of whom are seasonal, but the largest rivers are the Pienaars, which flows northward from the Roodeplaat Dam close to the western boundary, the Elands, which rises south of Cullinan and flows northward to the Rust de Winter Dam, then eastward towards Marble Hall and the Bronkhorstspuit (which flows through the Bronkhorstspuit Dam before joining with the Wilge River, which flows northward to the Olifants River.

1.6 Approach

The Environmental Management Framework is a strategic assessment to be put in place to provide guidance regarding future policies, plans and development initiatives.

The Department of Environmental Affairs provides the following definition for an EMF as "to proactively identify areas of potential conflict between development proposals and critical sensitive environments". The focus of an EMF is to promote sustainable development on a development planning and implementing level. Decision-makers can use the EMF as a framework for future development initiatives and to identify area of critical importance of the proposed area.

An EMF can only be useful if the development of the EMF used spatially representative information regarding environmental factors as well as land-use and socio-economic trends. All municipal areas within South Africa are obligated to prepare an IDP with associated sector plans for the municipal area over a period of five years. The role of the IDP is to identify the environmental, social and economical backlog in the municipality and then address these backlogs by developing future development plans to address these problems. South Africa as a developing country has the problem of poverty and infrastructure degradation within the municipal areas of the country. Issues such as housing, water services, electrical services, infrastructure maintenance and upgrading is some of the critical backlogs of municipal areas and therefore it can be assumed that problems of a lesser extend is left out in the development plans of the Integrated Development Plan.

Therefore an EMF is a useful tool to complement the IDP to ensure that the initiatives are met without compromising and harming sensitive environments within each municipal area.

1.6.1 Introduction to an EMF

The EMF is a management is a decision support system that provides 'state of environment' information, and integrates spatial planning for management. This tool is a strategic tool for integrating environmental considerations into management decisions.

This is achieved through the integration of spatially represented information with various environmental aspects as well as land-use and socio-economic activities. The decision support system is developed on a Geographic Information Systems (GIS) platform, the data of which can easily be integrated into existing GIS platforms because of the spatial nature of the information. The focus of its implementation is in the fields of environmental and development planning, and environmental impact management. The EMF has the capability to be tailor-programmed and designed to meet specific requirements. The versatility of the EMF enables its application at various scales ranging from local authority planning areas (1:2 500), to regional planning (1:50 000).

The final stage is the integration of the conglomeration of base information sets into a single coverage depicting and spatially delineating the potential environmental sensitivity of the area. This in turn forms the basis for a holistic environmental development framework that guides development and conservation priorities.

The EMF is therefore developed on a two tier basis comprising:

- Spatially represented information – digital and electronic maps, and
- A comprehensive policy and guideline framework.

The overall aim is to facilitate decision making that will ensure that sustainable management (conservation) of the natural resource base of the TLM. As such, the EMF will provide the following information:

- A complete survey of the sensitive areas,
- State of environment information based on all the baseline data – feature status,
- Identification of nature and conservation worthy areas,
- A comprehensive basis of baseline environmental and cultural-historical information,
- Identification of potential historical terrains and places of importance (special features),
- Development of environmental sensitivity zone classification,
- Development of an environmental development framework,
- Essential environmental information for land use planning and guidance for spatial development strategies,
- Classification of the area into zones of varying suitability and sensitivity for development, or local control zones,
- Establish an environmental framework within which sustainable development can take place.

1.6.2 Technical Development

The technical development of the Environmental Management Framework (EMF) entails the integration of spatially represented information with environmental policies and management requirements.

The EMF must be the overall basket within which all environmental and development decision-making information is kept and organised. It will therefore have:

- A database component;
- A policy component;
- All the different deliverables linked to an interactive GIS; and
- Reports.

It is a policy instrument that guides decision-making in a proactive way. The EMF must attempt to bridge the gap between the policy jurisdictions of the local and the provincial government departments. It must recognise

the different functions and provide a mechanism that integrates provincial and local authority needs in decision making.

1.6.3 *Phased and multidisciplinary approach*

The basic approach in this proposal is the use of multi-disciplinary expertise to conduct the work. Due to the short timeframe in which the project has to be completed, an approach where project components are developed in parallel facets instead of in a linear process was proposed.

The different elements are:

- The specialists are responsible for the gathering and assessment of information pertaining to the current status of the environment, infrastructure and development activities. The primary reporting output will be this Status Quo Document.
- The environmental management specialists are responsible for the gathering and assessment of information pertaining to legal, policy and economic aspects as well as the integration thereof with the results of the status quo assessment. The primary reporting output will be the Desired State.
- Similarly this team will be responsible for the intermediate elements (feature descriptions, feature status, feature objectives, etc.) that feed into the GIS system and also for the production of the different project outputs. The most important responsibility of the unit will be to ensure that all the project information is integrated into comprehensive logical, scientifically based and user-friendly end products
- The GIS component is responsible for the creation of an interactive GIS interface that holds all the relevant information in a repository that can be constantly updated throughout the project, the collation and manipulation of which provides the required data for the intermediate and final project outputs.
- The public participation team will make sure that the public and all stakeholders are provided with the opportunity to give inputs into the project at two specific stages:
- Draft Status Quo report; and
- Draft Strategic Environmental Management Plan (SEMP) and EMF report.
- A small management and administration unit is responsible for overall project management and the review and editing of all products. This group is also responsible for liaison with the MDM, and GDA&RD.
- Ultimately, the Status Quo will be compared to the Desired State, in order to compile management strategies and interventions that are required to steer the development of the area towards an ideal spatial framework. The Environmental Management Plan and other strategies will constitute the final Environmental Management Framework.

The development of an EMF follows a clear set of phases, namely:

1. Status Quo Assessment
2. Desired State Analysis
3. Management Zones Identification & accompanying Strategic Environmental Management Plan
4. Final EMF Compilation

Each phase builds on the findings of its predecessor, as well as the inputs from stakeholders and a central project steering committee. The final Environmental Management Framework consists of the most critical findings of the Status Quo Assessment along with a full set of environmental management guidelines for each identified Management Zone, as well as specific guidance on relevant strategic interventions such as the proclamation of protected areas and the interface with other environmental regulatory processes.

This report represents the second main phase of the project, namely the Desired State Analysis. It follows from a profiling of the study area that took place during the Status Quo phase, and involves an analysis of relevant environmental criteria according to feature status, legal and policy requirements, management objectives, and environmental opportunities & constraints.

The following diagram illustrates the composition of the components:-

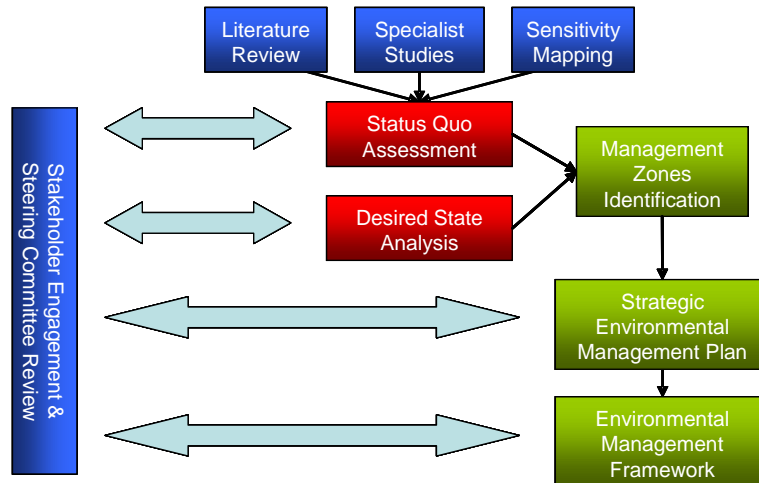


FIGURE 1: ENVIRONMENTAL MANAGEMENT FRAMEWORK COMPONENTS

1.6.4 Status Quo Assessment

Various subject-specific specialists are responsible for the gathering and assessment of information pertaining to the current status of the environment, infrastructure and development activities, as well as legal, policy and economic aspects of the study area. The primary reporting output is the Status Quo Report, accompanied by a series of more detailed specialist reports. At the same time, a Geographic Information Systems (GIS) team is responsible for a GIS interface that holds all the relevant information in a repository that can be constantly updated throughout the project, the collation and manipulation of which provides the required data for the intermediate and final project outputs.

1.6.5 Desired State Analysis

The Desired State phase is preceded by Public Participation, where comments on the Status Quo report are collected and form an important input into the Desired State. Public participation takes the form of a Public Open Day as well as specific sessions with different role-players and focus groups (such as landowners; eco-tourism operators; conservancies; etc).

Environmental management specialists are responsible for the assessment and integration of information into intermediate elements (feature descriptions, feature status, feature objectives, etc.) that feed into the GIS system and ultimately a Desired State analysis. The desired state phase provides a description of the desired state of the Metsweding area given all the available information and inputs.

1.6.6 Management Zones and Strategic Environmental Management Plan

The Desired State information feeds into the final Environmental Management Framework via the designation of environmental management zones and the compilation of a Strategic Environmental Management Plan.

Based on the Status Quo Report and the Desired State information, it is possible to gain a clear understanding of the development trends and environmental requirements in Metsweding. These are depicted as discrete management zones that form the basis for pro-active environmental management in the study area. The various management zones are used as to determine where and how certain development activities should take place, and the environmental framework and strategic environmental management plan (SEMP). The SEMP provides the guidance necessary for land use planning and environmental decision-making, but stops short of prescribing detailed design measures.

1.6.7 Final EMF

A second and final round of Public Participation ensures that the public and all stakeholders are provided with the opportunity to comment on the Draft Environmental Management Plan and EMF report. Again, this takes the form of a Public Open Day.

The results of the second round of public participation are used to verify and update the EMF report which can then be submitted to the National Minister of Water & Environmental Affairs for concurrence prior to official adoption by the Member of the Executive Council (MEC) for Agriculture and Rural Development in Gauteng.

1.6.8 Links to the EMF

Effort has been taken to ensure that the EMF for Metsweding District and the Dinokeng Project are aligned and that there are no conflicts between them. The Metsweding EMF area does overlap with the EMF which has been completed for the Dinokeng Project. In order to ensure alignment and that there are no conflicts, the zones within the area already under the Dinokeng EMF will remain the same. The only refinements are with new data that was made available on the Gauteng Agricultural Priority Area (GAPA) project and the recently published CPlan 3 linked to the draft Bioregional Plan for the City of Tshwane. The only zone this affects is the "Dinokeng Rural South" Zone that now has finer scale detail on important agricultural and biodiversity areas. In addition, the SEMP draws from the Dinokeng Project EMF to ensure alignment.

2 STATUS QUO FINDINGS

2.1 Municipal context

Metsweding District Municipality is characterised by the following main development patterns:

- Three main towns, namely Bronkhorstspuit, Cullinan and Rayton, each with an adjoining township;
- A large decentralised industrial area (Ekandustria) together with a larger low income settlement complex (Ekangala and Rethabiseng) to the north of Bronkhorstspuit;
- Extensive suburban residential development along the western boundary of the District, in particular in the southern part situated in Kungwini Local Municipality;
- Dispersed informal settlements and rural villages;
- A number of Agricultural Holdings complexes; and
- An extensive rural environment.

Bronkhorstspuit, Cullinan and Rayton historically formed the main service towns of the District, with Bronkhorstspuit being the main administrative and business centre. Most of the growth around these towns in recent years has taken place around Bronkhorstspuit, although in general the growth around the existing towns have been limited compared to the growth in the western part of the district. The Bronkhorstspuit Dam to the south of Bronkhorstspuit in particular has seen the development of a number of exclusive residential estates on the northern side of the dam.

The western part of Metsweding experiences enormous development pressure from residential development spilling over from Tshwane. In the north, this can be seen in the extension of the Hammanskraal area across the border into the Steve Biko settlement. Further south in Nokeng tsa Taemane Local Municipality, the greatest development pressure is experienced in the area to the south/south-west of Roodeplaat Dam, which is an extension of the urban development along Zambesi Road in Tshwane. This development comprises predominantly high-income residential estates, coupled with business development.

The bulk of this eastward expansion is however experienced in the Kungwini Local Municipality, starting with the greater Silver Lakes area and extending southwards past the Boardwalk and Mooikloof areas up to the areas to the south of the Rietvlei Dam along the R21.

Outside the 'formal' development areas, the District displays a larger number of dispersed informal settlements of varying size. These settlements are usually located along major roads or close to employment opportunities and result from (1) people coming into the District from the north or east looking for employment opportunities and (2) farm evictions.

The remainder of the District is an extensive rural environment comprising predominantly agricultural holdings, farms and natural areas. The area comprises a number of natural features and assets, conservancies, nature reserves and game farms. Some of these game farms and conservancies also comprise extensive tourism and accommodation infrastructure.

The northern part of Nokeng tsa Taemane Local Municipality has been demarcated as the Dinokeng Game Reserve, a provincial initiative.

Large non-agricultural land uses in the rural environment include the military base in Wallmansthal and various mines throughout the area. Metsweding is in essence a rural municipality, with moderate to high agricultural and conservation potential (the latter in particular refers to the Nokeng tsa Taemane area).

Illegal developments on farm portions and agricultural holdings and the lack of institutional capacity to address these developments are some of the greatest challenges facing sustainable rural development in the

Metsweding District Municipality. These illegal developments include illegal (formal) residential developments, industrial and commercial developments, and mining. .

Mining activity occurs across the District, ranging from small, often illegal, prospecting operations, quarries and sand mining to large, well-established and productive mines. While mining clearly plays an important economic role in the area, a concern is the visual and physical scars left on the environment by mining activities. The rehabilitation of these mines is often not attended to after they have closed down since they no longer provide any source of revenue.

The lack of infrastructure (in particular water-borne sewerage networks) is one of the key factors restricting significant further growth in the municipality. On the one-hand this has a positive impact in the sense that it curbs urban sprawl (to a certain degree), but on the other hand developments that are taking place without such a system (such as subdivision of farm portions, illegal residential developments on farm portions etc.) pose an environmental hazard. Lack of infrastructure also has an impact on the dolomitic areas and the quality of ground water.

The N4 highway running in an east-west direction through the District is an important movement linkage between the City of Tshwane in the west and Mpumalanga province in the east, as well as an important spatial structuring element.

Physical development in the Metsweding District Municipality is currently governed by the following spatial development frameworks:

- Metsweding District Spatial Development Framework, 2006;
- Nokeng tsa Taemane Urban Areas Spatial Development Framework, 2006;
- Nokeng tsa Taemane Rural Areas Spatial Development Framework, 2006; and
- Kungwini Spatial Development Framework, 2010 (draft).

These Spatial Development Frameworks are in most cases either too strategic to manage specific development trends or issues, or too focused on land uses as opposed to spatial restructuring. In the case of Kungwini Local Municipality, the new SDF is still only a draft document and the previous SDF were also never approved.

With the pending incorporation of the Metsweding District Municipality into the Tshwane Metropolitan Municipality, these frameworks will all have to be incorporated into the City of Tshwane's Metropolitan and Regional Spatial Development Frameworks.

2.2 Socio- economic Analysis

2.2.1 Socio-Economic Environment

The Nokeng tsa Taemane Local Municipality shows a more urban socio-demographic profile, similar to that of its neighbouring metropolitan municipality, the City of Tshwane (CoT), but it is not reflected in the land use profile. This may be ascribed to the profile of people who migrate to these areas. The municipality is fast developing where it borders the CoT, and along the main road to Cullinan. Migration can be ascribed to people who want to escape city life, and to people who come from rural areas in search for jobs.

Lifestyle estate developments seem to be mainly driven by a need of people to escape from crime, as well as busy city life. These developments may however actually contribute to crime, as they showcase the contrast between the 'haves' and the 'have nots', which is a natural driver of criminal activities.

Addressing backlogs in basic service delivery is a challenge for all the municipalities in the area. Rural areas and informal settlements contribute to these backlogs.

Metsweding municipality is challenged by high unemployment rates and low skills among the labour force. This is worsened by limited economic and working opportunities in the district and the migration of skilled

workforce to bigger metropolitan cities. This has the net effect of a population with low levels of disposable income and thereby, reducing buying capacity which is an economic stimulant.

The manufacturing sector is MDM's economic backbone although the recent global economic recession has made the economic situation bleak. The major economic activities of manufacturing and government services are mainly concentrated in Kungwini municipality thus forming a skewed distribution among the population.

The continued expansion and realisation of the Dinokeng project is likely to have positive impacts on the status quo of residents living in northern Metsweding. With a vision that prioritises strategic economic infrastructure, the development of tourism offerings, public-private partnerships, community involvement, SMME development and skills programmes, the Dinokeng Project is a major facilitator to economic growth and better livelihoods for residents in the project area. However, the Dinokeng Project cannot deliver economic growth and prosperity on its own; neither is tourism alone the answer to socio-economic freedom. Local government structures need to play their part here and ensure that they fulfil their own mandate and functions in order to complement the private efforts and thereby assist in an integrated and sustainable development for the area as a whole.

The Metsweding has a variety of social infrastructure which includes:

- primary health care clinics
- lower and upper primary and high schools
- libraries
- community centres
- fire and rescue services
- one private district hospital in Bronkhorstspuit, although there is a lack of public health facilities

Most of the facilities are predominantly in Kungwini local municipality.

2.3 Municipal Infrastructure and Services

The local municipalities of Kungwini and Nokeng are mandated to provide bulk water, sewerage and electricity services. The *Comparative Information on Basic Services 2009* report compiled by the Department of Cooperative Governance and Traditional Affairs provides updated data on the state of service provision in Metsweding.

Water is one of the basic human needs and statistics indicate that an average of 78% of the population in Metsweding have access to water supply. This distribution is similarly reflected in the local municipalities whereby 78% of households in Kungwini and 77% of households in Nokeng Tsa Taemane have access to water supply. Nevertheless, a mere 14% of households in Metsweding have access to free basic water and there is a backlog of 45% of basic water supply in the district.

Just over 50% of households have access to basic sanitation services which represents a backlog of sanitation provision services of 35% in Metsweding district. Some of the major factors influencing the provision of water and sewerage services in the district include the rapid development in housing and old piping reticulation systems which have not been upgraded in tandem with the growth experienced in the district.

Electricity in Metsweding is supplied by both Eskom and the local municipalities. Majority of the population in the urban nodes of Metsweding now have access to free basic electricity which is mainly used for lighting, cooking and heating. However, Metsweding faces the risk of increased electricity supply in the coming years due to the rapid expansion especially in Kungwini municipality. In addition, the rural population is yet to be adequately supplied with free basic electricity.

2.4 Spatial development conflicts

Threats to the planning vision for the Metsweding area arise from illegal land uses on farm portions and the shortage of institutional capacity at the municipal level to address illegal land uses.

Mining activities within the area have had a large impact on the ecological condition and subsequent 'sense of place' of the region. The location of sand mining and quarrying activities impacts on ecological processes and sensitive environments (such as wetlands) and has resulted in the subsequent destruction of some of these habitats. The mineral resource base of the area creates conflicting ambitions for the area as the expansion of mining areas and activities is likely to impact the existing and future environmental condition. Ultimately, if these environmental impacts are not properly managed they will impact on the tourism potential of Metsweding and especially on the tourism resources of the Dinokeng area and Cullinan.

The proposed Moloto Rail Corridor will improve accessibility to the area by rail. However, the effectiveness of this will greatly increase if an additional railway station is developed in the Dinokeng area (possibly near Kameeldrift).

The region is experiencing high levels of urbanisation and the spread of urban areas to the rural periphery has impacted on the land available for conservation and tourism. Accompanying this increased urbanisation has been the growth and spread of informal settlements and illegal land invasions within the project area.

The development of the Dinokeng Game Reserve and Cullinan as a tourism destination has been highlighted as the most economically, socially and environmental beneficial land use of the area. Existing plans include the expansion of tourism routes to connect nodes in settlements with high levels of poverty and unemployment.

2.5 Cultural Historic Resource Assessment

Collectively the cultural heritage resources of Metsweding spans a period of more than a million years. Uniquely the Metsweding area offers a snapshot of the history of South Africa in a relatively small area. The Metsweding area has rich cultural historical resources of which most are in a relatively good/stable condition when compared to adjacent areas or the remainder of Gauteng.

Although Heritage sites all enjoy statutory protection in terms of the act, few sites are formally proclaimed and protected. Many sites, especially Late Iron Age and Historical sites are threatened by urban sprawl and development. In addition the resource limitations and inefficiencies of the South African Heritage Resources Agency (SAHRA) as well as the Provincial Heritage Resource Agencies (PHRA) further aggravate the situation resulting in the loss of Heritage resources.

Within a large area such as the Metsweding district it is important to recognise that the intangible heritage resources are very difficult to underpin and manage. Fortunately a number of the oral traditions and legends have been recorded by various scholars (i.e. Van Vuuren 1992) that have worked in the area.

As an overall strategy for heritage conservation we would recommend taking a risk cautious approach by not only highlighting specific sites but to consider heritage resources in the broader sense and to rather highlight broad regions of sensitivity with buffer areas.

2.6 Mining

A total of 464 individual mining sites were recorded during the survey, of these 139 mines are active with the remaining 325 closed. Only 166 mines were classified as closed and rehabilitated whilst the remaining 298 mines are un-rehabilitated.

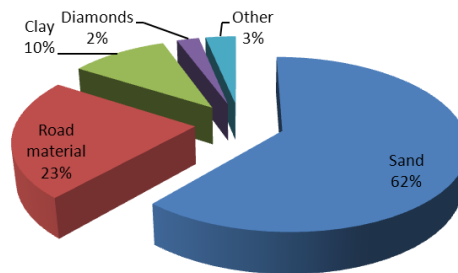


TABLE 1: MINING OPERATIONS RECORDED IN THE METSWEDING AREA

Mining activities are distributed throughout the Metsweding area and have a range of negative environmental impacts on the environment including the loss or destruction of habitat and associated decrease in biodiversity, a number of direct and indirect hydrological impacts, various types of pollution and the introduction/spread of invader plants.

Mining practices are inherently destructive in nature and have long term impacts. The principle and need for mine rehabilitation is well established in law being mandated by not only the Minerals and Petroleum Resources Development Act (Act 22 of 2002) but also reinforced by both the National Environmental Management Act (Act 107 of 1998) and the National Water Act (Act 36 of 1998) as well as all the regulations and guidelines promulgated under the acts and associated infrastructure.

In order for a mine to obtain a mining right they are required to conduct an environmental impact assessment and submit an environmental management program, while applicants for a prospecting right, mining right or reconnaissance permit have to submit an environmental management plan. Prospecting and mining rights only become effective under the MPRDA (Act 22 of 2002) on the date that the corresponding environmental management plan or program has been approved. Requirements for making financial provision for the remediation of environmental damage as well as for the issuing of a closure certificate are included in the MPRDA and include the requirement that financial provision must be in place before approval of the environmental management plan or program and the fact that an application for a closure certificate are compulsory upon lapsing of the right or cessation of activities.

2.7 Pressures on ecological systems in the study area

In the study area, the driving forces behind increased utilisation of ecosystem goods and services include the following:

1. Population increase - leads to increased demand for land for urbanisation, agriculture and industry as well as increased demand for natural resources and energy
2. Industrial/mining expansion - leads to demand for land, water and energy
3. Agricultural production - leads to demand for land for cultivation and animal husbandry as well as water and energy

These lead to the following:

1. increased urbanisation

2. increased cultivation
3. increased water use
4. increased energy usage
5. increased utilisation of target species

The consequence of these drivers may include the following pressures on natural ecosystems:

1. over-use of grazing resources.
2. water consumption leading to a reduction in water resources available for natural functions and potential reduction in water quality.
3. reduction in the size of populations of target harvested species, e.g. medicinal plants, game, etc.
4. loss of natural habitat, which affects whole ecosystems as well as the species that depend upon them.
5. degradation of natural habitat through species change, invasion by alien plants, loss of biomass or cover, and erosion or degradation of soil resources.
6. soil erosion, soil salinisation and desertification.

As a result of pressures, as described above, the 'state' of the environment is affected, i.e. the quality of the various environmental compartments (air, water, soil, etc.) in relation to the functions that these compartments fulfill is affected. The 'state of the environment' is thus the combination of the physical, chemical and biological conditions.

2.8 Biodiversity

Biodiversity within the Metsweding area has been highly affected by land transformation activities, notably urban expansion, mining and agriculture. The most sensitive and valuable features within the area include the ridges (notably the Bronberg area), remaining areas of intact natural vegetation, wetlands and river and riparian areas. Many of the remaining natural areas are under high pressure to be transformed and the EMF will need to clearly identify the important spatial features.

Based on updated landcover mapping of the study area, almost 38% of the natural vegetation of the study area has been transformed. Areas mapped as natural vegetation are often in a degraded state, especially when located close to transformed areas. This suggests that patches of untransformed natural vegetation in the southern half of the study area are probably in a relatively poor condition. This degradation is primarily due to fragmentation and edge effects, which cause species composition change and enhance invasion by alien species. The larger patches of remaining natural vegetation therefore tend to have the highest biodiversity value.

Rates of transformation differ from one vegetation type to another. Within the study area, the vegetation types of significant area that have been transformed to the greatest degree are Eastern Highveld Grassland and Rand Highveld Grassland, both of which are listed as Vulnerable (Draft Ecosystem List) / Endangered (Mucina et al. 2006). The vegetation types with the least degree of transformation are Loskop Mountain Bushveld, Springbokvlakte Thornveld, Gold Reef Mountain Bushveld and Central Sandy Bushveld.

The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists four vegetation type as Vulnerable (Table 3) on the basis of irreversible loss of natural habitat (criterion A1). Four vegetation types occurring in the study area are classified as Endangered and two as Vulnerable. The remaining six vegetation types are classified as Least threatened. According to section 54 of the National Environmental Management: Biodiversity Act (Act No. 10, 2004), "a municipality that must adopt an integrated development plan in terms of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000), must take into account the need for the protection of listed ecosystems."

TABLE 2: VEGETATION TYPES OCCURRING IN THE STUDY AREA

Vegetation type	Conservation status (Mucina et al. 2005)	Status (NEMBA)
Rand Highveld Grassland	Endangered	Vulnerable
Central Sandy Bushveld	Vulnerable	Not listed
Marikana Thornveld	Endangered	Vulnerable
Loskop Mountain Bushveld	Least Threatened	Not listed
Springbokvlakte Thornveld	Endangered	Vulnerable
Andesite Mountain Bushveld	Least Threatened	Not listed
Carletonville Dolomite Grassland	Vulnerable	Not listed
Eastern Highveld Grassland	Endangered	Vulnerable
Gold Reef Mountain Bushveld	Least Threatened	Not listed
Norite Koppies Bushveld	Least Threatened	Not listed
Eastern Temperate Freshwater Wetlands	Least Threatened	Not listed
Subtropical Freshwater Wetlands	Least Threatened	Not listed

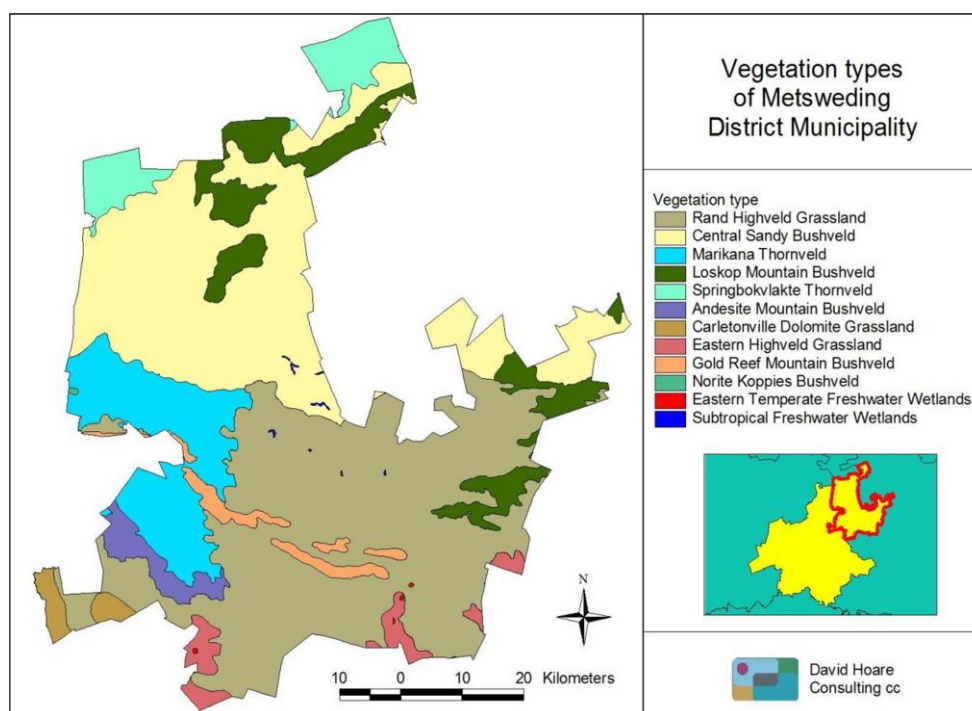


FIGURE 2: VEGETATION TYPES OF THE STUDY AREA (ACCORDING TO MUCINA ET AL. 2006)

Ten threatened and thirteen near threatened plant species are confirmed to occur within the study area. There are also nine declining and one rare plant species that have been confirmed to occur there (see the status quo report for species names and specifics).

The vegetation types that are of the greatest importance for supporting priority populations of threatened plant species are Gold Reef Mountain Bushveld, Rand Highveld Grassland, Central Sandy Bushveld and Loskop Mountain Bushveld. Ridges in different habitats are potential habitat for eleven of the priority species discussed above, which indicates that it is key habitat for threatened plant species.

2.8.1 Features of high biodiversity importance

Features of high biodiversity importance in the study area include the following:

- Remaining areas of vegetation of conservation importance: this is based primarily on the Draft Ecosystem List and the assessment of the conservation value of vegetation types in the scientific literature (Driver et al. 2005; Mucina *et al.*, 2006);
- Red List flora that occur within remaining natural habitats within the study area;
- Areas classified as mountains, ridges or steep slopes;
- Perennial and non-perennial rivers, streams and watercourses.

2.8.2 Ecological issues in the study area

The most significant cause of biodiversity loss throughout the world is loss or severe degradation of natural habitat. Most severe transformation of habitat arises from the direct conversion of natural habitat for human requirements, including cultivation, rural and urban development, industry and infrastructure. In addition there are indirect impacts on natural habitat such as alien invasive plant species, overgrazing and overexploitation of biodiversity. The resulting impacts on ecosystems are loss of biodiversity, habitat degradation and fragmentation, and deterioration of ecosystem health and the services provided.

Any activities that compromise the integrity of any of the ecosystem services and functions can be considered to be an issue. A list of potential issues in the study area includes the following:

1. Loss of natural habitat (mining, cultivation, urbanisation)
2. Over-utilisation of grazing resources leading to loss of biomass and change in species composition, including woody thickening.
3. Selective harvesting of woody plants
4. Selective harvesting of medicinal plants
5. Use of water leading to changes in hydrological flows and reduction in water quality available to natural ecosystems, e.g. eutrophication which can lead to impacts on biodiversity
6. Land degradation leading to the loss in the lands ability to attenuate water flow and regulate water supply
7. Trampling / compaction of soil leading to loss of vegetation cover
8. Soil erosion leading to loss of soil resources as well as siltation of wetlands and water bodies
9. Soil salinization
10. Industrial and/or domestic pollution of natural areas
11. Invasion by alien plants.

2.9 Water

Metsweding District Municipality is situated in the upper catchments of the eastern watershed of South Africa. Surface water resources are prominent across the municipal jurisdiction and form the headwaters of major rivers therefore having the possibility of impacting on areas far beyond the municipal boundary, due to the dynamic and systematic qualities of a water resource system.

Water is utilised for both social and economical benefits in the MDM, providing a capacity for growth and development. Surface water which includes rivers, dams and wetlands provides a beneficial quality to promote development such as the Rooideplaatsdam and Bronkhorstspruit development nodes. Groundwater is essential to the livelihoods of the rural areas and promoting agricultural activities around MDM.

The groundwater yield is not considered to be a major source of water due to the inadequate aquifer potential in the underlying geological formations. The potential beneficial use of the groundwater resources in the MDM should however not be underestimated due to its use in rural areas including rural villages and small towns.

Mining activities has a range of potential impacts on water resources including transformation, contamination of the water resources and industrialised consumptive water use. There are a number of management guidelines in the use of water for mining activities but consideration for the guidelines is not implemented at most of the mining operations. Management considerations should include monitoring of water resources associated with mining activities and implementation of rehabilitation measures after the operation of the mines, especially sand mining and quarries situated within wetland areas.

Development pressure on water resources is expected due to the proposed integration of the MDM with the City of Tshwane and Ekurhuleni Metropolitan Municipalities respectively. Development proposals are concentrated along the western boundary of MDM and will be mostly be due to the peri-urban extensions from the City of Tshwane. The major concerns are encroachment of urban areas into the drainage systems. Cumulative effects as a result of urban encroachment on drainage systems are extensive and the impacts thereof are seen far beyond the boundary of the municipal jurisdiction. The management objective should therefore concentrate on protecting urban rivers against encroachment and proposing measures such as stormwater retention initiatives in future development.

Agricultural activities is one of the most prominent land uses in MDM. Impacts resulting from the sector includes the use of water from irrigation and stock watering, fertilizers adding to the nutrient load of the water resources and crop development along the banks of the rivers leading to transformation of the riparian zone of the rivers. The development is focused on implementing all water use requirements in the agricultural sector including water use license requirements and verification processes. Monitoring agricultural activities and its associated water uses should also be set as a high priority. The development of agricultural hubs, in areas where the agricultural potential is high, will result in better management of the water use associated with a hub; other than scattered agricultural land uses across the entire municipal area.

Water quality in and around Roodeplaas has a poor public perception due to publicised cases of algal and hyacinth blooms in the dam which rendered it unacceptable for human use. The outbreaks of these vegetative invasions are triggered by nutrient overloads that enter the reservoir from the Baviaanspoort water treatment works and the various watercourses feeding the dam from the catchment areas situated partly in the City of Tshwane and partly in Kungwini¹. The blooms result in an increased biomass that has to be decomposed biologically as well as a measure of eutrophication that contributes to the load of dead vegetative and animal matter. This, however, does not imply that the water quality of the dam is beyond redemption, or out of control. The problem has more 'nuisance' value than serious health and environmental risks, as the decomposing matter leaves a rotting smell, and the floating vegetation clogs machinery.

The two wastewater treatment plants that discharge more or less directly into Roodeplaas are Baviaanspoort and Zeekoeigat. Combined, these supply approximately half of the dam's 40 million m³ capacity. By all accounts, Zeekoeigat is operating at a satisfactory standard with water discharges at acceptable level. Baviaanspoort, however, struggles with inconsistent effluent inflows which reduces the effectiveness of the treatment process and resultant quality of the water discharge.

In addition to the wastewater release, Roodeplaas also receives contaminated water from the Pienaars River, Moreleta/Hartbeest Spruit and Edendale Spruit which collect pollutants from the eastern suburbs of Tshwane, the industrial areas of Silverton-Waltloo, the farming areas of Donkerhoek and the poorly serviced townships of Mamelodi. This is due to bad or inadequate urban water catchment management practices. Especially problematic is the failing sanitation infrastructure in Mamelodi that add biological contamination directly to the watercourses. The problem relates to both sewer leaks and poorly designed networks that have too many points of failure (e.g. multiple pumpstations) due to fragmented planning.

¹ DWAf, 2003: Project Report: Phase 1 - Development of a strategy to control eutrophication in South Africa, Directorate of Water Quality Management.

A lack of adequate bulk sewer reticulation networks and fully operational water treatment plants in the Dinokeng area adds to the problem of the eutrophication of surface water resources. In addition, the reliance on septic tank systems and the continued installation of septic tanks in areas not serviced by bulk sewer reticulation can lead to groundwater contamination. Impoundments and dams, along with soil erosion, agricultural and mining activities, chemical and bacterial pollution and urban expansion are all affecting the surface water quality, and in turn the biodiversity of the region.

Wetlands are also specifically threatened in the study area. Typical impacts include degradation and damage due to irresponsible development, erosion due to altered hydrological regimes, sedimentation as a consequence of erosion, replacement of natural and indigenous vegetation, agricultural runoff and extensions, as well as mining activities.

2.10 Agriculture

The majority of agricultural activities and cultivated lands are situated in close proximity to the major watercourses namely the Hartebeestspruit, Pienaars River, Edendalspruit, Premiermynloop, Rooispruit and Krokodilspruit. Production methods consist of both dryland farming, albeit limited, and irrigation, with the latter conventional as well as rotational irrigation. Main crops relate to maize (mielies), potatoes, wheat, soya beans, planted pastures (*Eragrostis*), forage crops (lucerne) and a variety of vegetables such as carrots, lettuce and tomatoes. Other activities include sheep, cattle, goat, chickens, stock breeding and ostrich farming. A number of stables for horses and equestrian facilities are found within the study area.

The Gauteng Department of Agriculture, Conservation and Environment has also demarcated a number of agricultural hubs throughout the province. These hubs relates to the creation of centres of high quality agricultural activity, where niche market agricultural products such as vegetables, including indigenous vegetables, flowers, herbs and spices, will be farmed. The first of these hubs were launched in the Metsweding District in 2007, of which a substantial part lies in the south-eastern part of the Nokeng tsa Taemane municipal area.

There is a great difference between land types in terms of both the soils occurring as well as the associated agricultural potential. There is also a significant difference in the **dominance** of the agricultural potential classes within each land type, so that certain land types may be strongly dominated by one potential class, while others may have a more even distribution between the three classes.

2.11 Legal context

The current environmental legal framework provides various legal means to address risks to the sustainable development of the Metsweding District Municipality. The importance of co-operative governance is stressed as being essential to achieving the overall vision and objectives.

2.11.1 Legal origin and nature of the EMF

The legal origin of an EMF is embedded in Sections 24(2) & (3), Section 24(4)(bA)(i), Section 24O(1)(b)(v) and Section 44(2) of the National Environmental Management Act, 1998 (NEMA) (as amended) which allows the Minister of Water and Environmental Affairs or Member of the Executive Council (MEC) to whom a provincial premier has assigned the responsibility for environmental affairs, to compile environmental information and maps of particular geographical areas which must be taken into account in decision making by authorities.

Regulation 547 of 18 June 2010, the Environmental Management Framework Regulations, provides further specific regulatory requirements pertaining to the development of an EMF. It specifies that either the Minister or an MEC may initiate an EMF for an area, and that a draft EMF must be subjected to a public participation process. Once the draft EMF has been reviewed in the light of any representations, objections and comments received, the Minister or MEC may adopt the EMF as an environmental management tool.

2.11.2 Environmental Impact Assessments

The EMF, once adopted by the provincial MEC and national Minister tasked with Environmental Affairs, will have to be taken into consideration in environmental impact assessments in or affecting the geographical area to which the framework applies. In terms of the EIA Regulations the applicant (and more specifically the Environmental Assessment Practitioner) will have to give notice in writing of the proposed application to any organ of state which has jurisdiction in respect of any aspect of the proposed activity.

The Development Facilitation Act, Act No.67 of 1995 (DFA) also provides the possibility for the Metsweding District Municipality (or the City of Tshwane after the merger) to request an investigation in terms of activities which are believed to have been performed contrary to the procedures prescribed in the Act.

2.12 Summary table of opportunities within the Metsweding area

The following table provides a summary of the key issues identified in the Status Quo assessment. These issues are categorised according to the various features.

TABLE 3: SUMMARY TABLE OF CONCERNS AND OPPORTUNITIES

	CONCERNS /KEY ISSUES	OPPORTUNITIES
HERITAGE	<p>Study area is very large and a detailed heritage survey takes years to complete.</p> <p>Capture of detailed oral history requires several years.</p> <p>Stone Age sites are threatened with development and are vulnerable to damage by tourists who take souvenirs.</p> <p>Iron Age sites with stone walls are threatened by damage as a result of people removing the stones for use in building and landscaping e.g. Iron Age site at Elandshoek 337JR.</p> <p>Penetration of game hunting poses a threat to the black population in the area which supplied labour to the farms. This will have a negative effect on the socio-economy of the area.</p> <p>Cullinan is a good representation of English and mining architecture and therefore needs to be conserved urgently. The flourishing tourism industry needs proper management that is in harmony with the cultural legacy.</p> <p>Non-tangible heritage resources need to be recorded from knowledgeable people before the information is lost forever.</p> <p>Knowledge of traditional medicinal plants and animals and legends and beliefs on animals and plants needs to be recorded.</p>	<p>Stone Age sites can be developed as site museums thus contributing to knowledge of the area and its people and as a tourist attraction.</p> <p>History of the “Oorlamse” people found during the Anglo-Boer war needs to be documented as the area risks being taken over by squatters but does present a tourism opportunity.</p> <p>Art of beadwork by the Ndebele people needs to be preserved and utilized as an income resource.</p> <p>Cullinan mine can be exploited as tourist attraction since it is the world’s leading diamond mine and is a protected site.</p> <p>A strategy for the re-utilization of existing buildings with a rich historical background needs to be formulated thus preserving the cultural experience. E.g. farm houses could be turned into places for overnight accommodation for tourists.</p> <p>An African integrated approach where nature is culture needs to be followed in the marketing and tourism strategy of Metsweding.</p> <p>Cullinan is unique as it keeps developing. Cullinan needs a management plan prepared by a specialist and all heritage sites must be</p>

CONCERNS /KEY ISSUES	OPPORTUNITIES
	<p>preserved.</p> <p>Priority tourism nodes in Metsweding include Dinokeng, Cullinan, Roodeplaat Dam, Willem Prinsloo Agricultural Museum, Rust de Winter Dam and Bronkhorstspruit Dam.</p> <p>Plenty of Ndebele sites formed during the Iron Age are present on the southern part of Metsweding. The most important site is Komjekejeke found on the Farm Downbern 494JR this is where 5 of their chiefs are buried.</p>
<p>MINING</p> <p>Only 43 % of the mines identified during the survey are active and only 38% are rehabilitated.</p> <p>Extensive sand mining in Metsweding threatens Boekenhoutspruit catchment which flows through the core area of the Dinokeng Game Reserve. In addition, most sand mines are poorly rehabilitated.</p> <p>Sub-division of previously mined areas for residential development is taking place in the area. This is risky because the areas are wetland thus homes could sink or becoming damp.</p> <p>Some un-rehabilitated mines have been converted into 4 by 4 tracks therefore setting of a cycle of other problems.</p> <p>Negative impacts associated with mining in the Metsweding area include:</p> <p>Loss of vegetation cover and habitat. Sand mining is especially destructive to wetlands.</p> <p>Hydrological impacts due to increased sediment load and runoff velocities. Major impacts are changed or altered water courses and damage to water quality</p> <p>Increased sedimentation and erosion as a result of removal of vegetation cover.</p> <p>Pollution including dust, soil, noise, industrial waste, toxic waste and water. Soil pollution by hydrocarbons (oil & diesel) is widespread on many mining sites. Non-rehabilitated mines e.g. old Edendale mine poses a health risk to the surrounding community due to waste dumps contaminated with lead.</p> <p>Introduction of alien and invader species such as eucalyptus and Acacia (wattle) species.</p> <p>Generally, small informal and illegal mines pose the</p>	<p>Mining is a major economic activity and employer in the area.</p> <p>Proper rehabilitation of mined areas has a potential of increasing diversity in the area and habitat creation e.g. seasonal pans created during the wet season are a breeding site for waterfowl.</p> <p>Significant mineral resources are still available in the Metsweding area and can be used to the economic benefit of the communities in the area if done correctly.</p> <p>The only large and economically significant current mining operations in the Metsweding area are Vergenoeg fluorspar mine and Cullinan diamond mine.</p>

CONCERNS /KEY ISSUES		OPPORTUNITIES
greatest threat to the area.		
<p>SOILS & AGRICULTURE POTENTIAL</p>	<p>High soil potential areas should be conserved as they are threatened by transformation due to developments such as housing.</p> <p>Agricultural runoff and the use of pesticides by farmers has a negative impact on biodiversity and water quality</p>	<p>Cultivated areas are concentrated to the south and south east of Metsweding.</p> <p>High potential soils especially dominant in the south east towards Bronkhorstspruit should be protected and excluded from development plans.</p> <p>Agricultural activities should be developed in the high potential areas however; they are also often earmarked for development. Agricultural holdings are largely concentrated along the western boundary of the District adjacent to the City of Tshwane.</p>
<p>FAUNA</p>	<p>Development of residential estates, mining, industrial activities and agricultural activities threaten the fauna in the area due to the loss of natural vegetation which forms habitats. These need to be monitored especially for the preservation of riparian habitats and wetlands which maintain fauna assemblages.</p> <p>Rocky ridges and hills in the study area are crucial for maintaining the fauna biodiversity (some are Red Data Species) and are used as wildlife corridors.</p> <p>Use of pesticides for the control of rodents and birds which invade farms is widespread.</p>	<p>Cultivation areas and quarries that have been abandoned can be rehabilitated in order to provide habitat for fauna.</p> <p>Mining areas can only be suitable for fauna conservation if well rehabilitated.</p> <p>Nature reserves and conservancies found in Metsweding district are important channels of protecting habitats and sensitive fauna species. These need to be properly managed and protected for the well being of biodiversity.</p>
<p>DEVELOPMENT PLANNING</p>	<p>Development has intensified towards the west of the district in the sections bordering the City of Tshwane and it includes both low-income and high-income developments.</p> <p>The District has a large number of informal settlements of various sizes scattered across the municipal area.</p> <p>Highest population densities are found in previously disadvantaged township E.g. Refilwe</p> <p>6 new regional roads are planned for the area and this will increase the connectivity and accessibility of the southern part of the district in particular.</p> <p>Existing railway line needs to be upgraded in order to provide transport services for commuters.</p>	<p>Metsweding is largely a rural municipality with moderate to high agricultural and conservation potential which can be properly utilized for the benefit of the entire area.</p> <p>Roodeplaat dam nature reserve and Dinokeng game reserve are some of the well known conservation areas in the District.</p> <p>The district and settlements within are well served and connected by internal road infrastructure, with the main towns located adjacent to major roads.</p> <p>Extra efforts should be made to manage and protect Metsweding's natural environment from inappropriate development.</p>

CONCERNS /KEY ISSUES

OPPORTUNITIES

The proposed new railway line (Moloto Rail Corridor) lies between Moloto on the Gauteng-Mpumalanga provincial boundary and Tshwane. This will ease congestion on the Moloto road and eradicate unsafe travelling conditions by Public Service Vehicles.

The spread of informal settlements far from each other and major towns poses the challenge of providing and maintaining services at high cost and creating further pressure on the need for social infrastructure and housing.

The scattered location of settlements across Metsweding has a negative impact on the efficient and sustainable spatial development of the municipality, as settlements are not focused around strategic locations that can be incorporated into a network and hierarchy of places and infrastructure.

The largest settlement trend in the District is the development of private residential (security) estates predominantly in the western area adjacent to City of Tshwane which gives an unbalanced impression.

Larger land subdivisions are allowed in the northern areas while smaller land subdivisions are allowed in the southern areas especially around the existing urban development areas.

The proximity of Metsweding to Tshwane and Ekurhuleni metropolitan municipalities attracts migrants in search of employment opportunities in Gauteng.

Illegal industrial and commercial land uses on agricultural holdings and farm portions are also widespread throughout the District.

The two local municipalities do not have sufficient resources to manage illegal land uses which include residential, industrial and commercial developments.

The lack of infrastructure particularly sewage networks restricts significant growth within the municipality and poses a serious threat for the future.

The entire north shore of Bronkhorstspuit dam has been developed along with other important heritage sites.

Rural land management in the municipality is virtually non-existent in deed.

CONCERNS /KEY ISSUES	OPPORTUNITIES
<p>SOCIO-ECONOMIC</p>	<p>Metsweding has been recognized as the district with the least contribution to Gauteng’s GDP and with the greatest infrastructural deficits.</p> <p>Kungwini is largely urbanized while Nokeng Tsa Taemane is more rural with a growing trend of urbanization in the form of conversion of farms to townships.</p> <p>The population of the District seems to be decreasing mainly due to the HIV/AIDS scourge and rural to urban migration. A healthy, growing and skilled population is required for positive economic growth of the area.</p> <p>The population of Metsweding is composed of a working age group which creates pressure for the provision of more employment opportunities.</p> <p>A large number of dwellings in the District are informal.</p> <p>The levels of education in Metsweding are very low particularly in Nokeng Tsa Taemane local municipality.</p> <p>Social, economic, resource-related, educational, employment and infrastructural redress must take place as the black population (77% of the total population) still has inferior access and provisions for all of these areas.</p> <p>Poor access to refuse removal is a factor which may cause an increase in pollution and disease.</p> <p>Schools need upgrading in both LMs and more tertiary educational options need to be made available so that the skill levels in the whole district may rise.</p> <p>Metsweding has poor air quality due to veld fires, mining, industry, agriculture, landfills and domestic pollution.</p> <p>Metsweding desperately requires a dedicated and fully equipped public hospital as people currently have to travel great distances for specialized and affordable care.</p> <p>Roads in the rural and outlying areas of the district need to be upgraded and maintained well so as to increase and improve accessibility in the District.</p> <p>Crime is a major problem in the District and is hampering development. As long as poverty and low education levels persist, crime will remain a</p>

CONCERNS /KEY ISSUES	OPPORTUNITIES
<p>challenge.</p> <p>Funding in the District is low though there are numerous development demands that need to be addressed.</p>	
<p>FLORA</p> <p>Metsweding has three plant species that are threatened and one that is near threatened and endemic to Gauteng province.</p> <p>38% of natural vegetation in the area has been transformed mainly by cultivation, commercial livestock farming, mining, urbanization and alien plant invasions. The transformation occurs mainly in the southern half of the municipality.</p> <p>Generally, vegetation in the Northern section of the District is intact while the southern section has degraded vegetation with many species being endangered.</p> <p>High habitat loss is being experienced due to cultivation and urbanization with alien vegetation affecting water courses. E.g. Bronberg area is under extreme pressure by mining and construction although it has valuable biodiversity.</p> <p>According to the National Environmental Management Biodiversity Act No. 10 of 2004, four vegetation types in the area as classified as vulnerable on the basis of irreversible loss of natural habitat. These are Rand Highveld grassland, Marikana thornveld, Andesite mountain bushveld, and Eastern Highveld grassland.</p>	<p>Areas that have been identified as containing vegetation types of high conservation value need to be protected.</p> <p>Ridges have high biodiversity and therefore more effort is needed to protect them. Furthermore, ridges are a vital habitat for many (65%) threatened plant species in Gauteng.</p> <p>Gold Reef mountain bushveld, Rand Highveld grassland, Central sandy bushveld and Loskop mountain bushveld are fundamental vegetation types for sustaining priority populations of threatened plant species.</p>
<p>WATER RESOURCES</p> <p>Wetlands in Metsweding have been disturbed by the spread of residential developments.</p> <p>The provision of ecosystem goods and services provided by wetlands is under threat from activities like mining, informal and formal settlement developments and invasion by alien vegetation. Some of these services include sediment trapping, toxicant removal and water supply.</p> <p>Other threats to surface water bodies in Metsweding include poor solid waste management; erosion of river banks, and overgrazing in riparian zones.</p> <p>Water supply and demand measures and control of infrastructure development from a groundwater perspective needs to be implemented.</p>	<p>Urgent measures need to be taken to protect aquifers in Metsweding from pollution from sources such as metal leaching from mines, and sewage from developments.</p> <p>Water resource systems function at optimal when representative biota are presented across the respective riparian zones.</p> <p>Metsweding is an important water catchment area for the Elands and Pienaars River and there are a number of streams and wetlands. Other important systems are Bronkhorstspuit and Wilge rivers. Other natural features are the Bronkhorstspuit dam and the Rooopleat dam.</p> <p>The most significant natural wetland types found in the study area in terms of surface area are the Floodplain and Valley Bottom systems. They provide the most water in terms</p>

CONCERNS /KEY ISSUES	OPPORTUNITIES
	of ecosystem services as well as habitat for cosmopolitan biota (birds, frogs, reeds).

It is important to understand the nature of potential conflicts that arise out of the Status Quo assessment. These conflict areas will direct the formulation of the Desired State, and the Strategic Environmental Management Plan in terms of management zones and associated management guidelines.

TABLE 4: MATRIX OF POTENTIAL CONFLICTS IN METSWEDING DISTRICT MUNICIPALITY

	BIODIVERSITY AND CONSERVATION	WATER	HERITAGE	MINING	DEVELOPMENT PLANNING	SOCIO-ECONOMIC	SOILS & AGRICULTURE
BIODIVERSITY AND CONSERVATION		Water points	Access	Habitat loss	Encroachment Land use conflict Urban sprawl Inappropriate development	Encroachment Alien species	Land management Alien species Disease and stock control Pesticides and chemicals Eradication of landscape features
WATER				Pollution Abstraction	Water demand Infrastructure Wetlands destruction Treatment	Encroachment Pollution Subsistence agriculture Demand Reduction in groundwater recharge	Over-abstraction Water quality
HERITAGE				Loss of sites Sterilising resources	Loss of sites Budget priorities Access routes	Budget priorities	Sensitive sites cultivated Undiscovered heritage Farm buildings
MINING	Mineral resources inaccessible on conservation land	Invasion of alien species	Mineral resources inaccessible				Threat to the soils
DEVELOPMENT PLANNING				Incompatible land uses		Continuing low standards of living	High potential agricultural lands
SOCIO-ECONOMIC	Alien species from disturbance (e.g. quad biking)		Vandalism and theft	Pollution Health problems	Informal settlements		
SOILS & AGRICULTURE	Land use conflicts Land management Alien species Disease and stock control		Undiscovered heritage	Sterilising land Pollution Water resources			
WATER RESOURCES	Urbanization Water quality over abstraction Riparian invasion.			Water quality Acid mine drainage Over-abstraction Dewatering Loss of riparian areas Loss of wetlands	Urban Sprawl		Water quality Over-abstraction Loss of riparian areas Loss of wetlands

3 DESIRED STATE ANALYSIS

3.1 Compilation of the Desired State

The formulation of a desired state report for the Metsweding EMF project relied on stakeholder engagement and thorough information analysis, in consideration of the overall developmental vision for the area.

3.1.1 Public Participation

Stakeholders were engaged at a Public Open Day and in the form of individual consultation sessions. These allowed Interested and Affected Parties (I&APs) to:

- Verify that issues and points of concern have been considered by the environmental specialists and technical investigations;
- Raise comments and issues of concern about the Status Quo Report;
- Identify other relevant interested or affected I&APs; and
- Express their views regarding the future socio-economic development and conservation of the natural resources in the area.

3.1.2 Information analysis

The information analysis describes each environmental feature class as identified in the Status Quo report in terms of feature status, legal and policy requirements, management objectives, and environmental opportunities & constraints. The status of each of the features is determined through legislative requirements, accepted norms and quality standards, as well as through technical and specialist input. The feature objectives, which establish principles of how the features or environmental resources should be managed to improve its environmental status, were however determined during the I&AP consultation sessions. For the purposes of this document a “management objective” has been defined as “A formally established, more or less quantitative target that is actively sought and provides a direction for management action.”

By comparing the status of the features with their legal requirements and development needs, the type and extent of the required management intervention can be determined. Feature status can then be improved through the establishment of stringent management requirements.

The following sections describe the management objectives (or actions to achieve the desired state) for each key topic as well as the legal and policy requirements and any development parameters for each. The final EMF will draw together these inputs per specialist areas into a management framework for spatial planning and decision making.

3.2 Management objectives for spatial planning

3.2.1 Key issues areas for spatial planning

The Management Objectives (Desired State) for physical development and spatial planning looks specifically at the following key issues:

- Towns and townships
- Residential Expansion from Tshwane/Ekurhuleni
- Informal Settlements
- Rural Environment
- Land Use Management around environmentally sensitive environments
- Spatial Planning
- Institutional Capacity

3.2.1.1 Towns and townships

The existing towns and their associated townships should be developed as integrated, sustainable (environmental, social and financial), equitable and well-functioning urban centres in the District.

The existing towns in the District represent decades of investment in property, infrastructure and business and social services. They are centrally located within the District and generally well connected by means of road infrastructure, both internally and with areas outside of the District.

As such, these towns should be prioritised as further development and investment areas, as opposed to creating new development areas where new infrastructure, services and facilities need to be provided. Existing land (both developed and vacant) within and directly around existing towns/townships should be developed optimally, in line with available engineering infrastructure capacity, accessibility and regional function/importance and in accordance with a clear and functional spatial logic.

Townships adjacent to these towns should be spatially and functionally integrated with the main towns. Urban growth boundaries should therefore direct growth between the town and its township(s), as opposed to further away from it.

Bronkhorstspuit in particular should be further developed as the major urban centre. Consolidation of the overall urban environment stretching from Zithobeni down to Bronkhorstspuit Dam must be achieved. To facilitate this, a detailed Urban Development Framework is required to direct and manage future development in this area towards the achievement of stated objectives.

3.2.1.2 Residential Expansion from Tshwane/Ekurhuleni

The Chapter 1 Principles for Land Development in the Development Facilitation Act, 1995 ("the DFA Principles") states that land development practices should "*discourage the phenomenon of "urban sprawl" in urban areas and contribute to the development of more compact towns cities*".

The extensive suburban development along the western boundary of the District represents urban sprawl from a metropolitan perspective with implications for the sustainability and functionality of the eastern part of the metropolitan area, and should therefore be viewed as a metropolitan (Tshwane) issue as opposed to a District issue. Any infill and compaction strategies that the City of Tshwane may have are in essence cancelled out by the continuous eastward urban expansion. The imminent incorporation of the Metsweding District Municipality into the City of Tshwane Metropolitan Municipality will therefore require the City of Tshwane to critically review the eastward expansion and the implications thereof on infrastructure provision (including the standard of infrastructure), road networks, traffic generation and environmental implications.

Ideally, the current Kungwini Local Municipality Urban Edge should be reconsidered and reduced as part of the Tshwane Metropolitan Spatial Development Framework. However, if the current (as understood approved) urban boundary cannot be reduced due to legal implications, then the future development of this area as a suburban/urban area will have to be rethought and redesigned.

A detailed and multi-sectoral Urban Development Framework must be compiled for the Silver Lakes/Mooikloof/R21 area that will deal with (1) the future spatial structure, (2) movement networks, (3) land use typologies, intensity, diversity and design, (4) environmental conservation, (5) the provision of social and community facilities, (6) engineering infrastructure, (7) growth management to prevent leap-frog development and (8) social diversity. The development of the entire area should in essence be developed according to the principles of sustainable human settlements, as set out in *Breaking New Ground: A Comprehensive Plan for the Development of Sustainable Human Settlements*.

Future development in this area should therefore be made subject to stringent development management (as opposed to the fairly haphazard manner in which it has taken place to date) to ensure a sustainable, equitable and functional outcome.

3.2.1.3 Informal Settlements

The DFA Principles also state that land development practices should “*should discourage the illegal occupation of land, with due recognition of informal land development processes.*”

Informal settlement development in the rural environment should as far as possible be restricted. Land invasions should be monitored and addressed before settlements become permanent. However, it is acknowledged that migration of people into the area and the resultant informal settlements cannot be prevented and should therefore be managed. The focus should therefore be on containing informal development around the existing formal towns and townships, and preventing the establishment of ad-hoc, dispersed informal settlements. In this manner, the informal townships have the best chance of eventual upgrading, service delivery and ultimately formalisation.

In-situ upgrading should only take place where these informal settlements are part of or adjacent to an existing urban environment. Families living in informal settlements located in rural areas should be relocated to housing developments in either urban areas or defined rural settlements.

All informal settlements in environmentally sensitive areas or located in hazardous areas (floodlines, dolomitic areas etc.) should be relocated.

3.2.1.4 Rural Environment

The Metsweding District’s primary function from a regional perspective is that of a rural area adjoining a large metropolitan conurbation that essentially provides in the needs of the metropolitan area for fresh produce, recreation and rural residential opportunities. The preservation of the rural environment should therefore in essence take higher priority than promoting urban development in the area.

Conservation of natural areas and agricultural land is one of the key spatial strategies of the Metsweding District Municipality. The Metsweding Spatial Development Framework has demarcated a substantial part of the municipal area as a District Open Space System (DOSS) with the aim of protecting the conservation resources that exist in the district and to protect the valuable agricultural land that are found in the district for future generations.

As the rural and natural environment is Metsweding’s greatest asset, care should be taken to protect these from continuous urban development pressure, unsustainable subdivisions, illegal land uses and destructive mining practices. It is in particular the natural assets such as dams, rivers and ridges that are under most threat as these are often the most desirable locations for development (in particular exclusive developments).

Particular rural elements that must be protected and enhanced include high potential agricultural soil, natural environment, tourism and rural living opportunities.

The subdivision of farm portions will have to be standardised into a single subdivision policy for the area, which is incorporated into the Spatial Development Framework(s). A common understanding of what is feasible from an agricultural as well as conservation point of view needs to be achieved and agreed on.

Smaller subdivisions (i.e. agricultural holdings and so-called ‘country-estates’) could be permitted around existing urban areas, to act as transition zones between the urban and rural areas and also to provide rural lifestyle opportunities in the area. In the remainder of the area only large subdivided portions should be permitted. Any future revision or amendment of relevant spatial development frameworks for the area should set the parameters for residential densities in so-called country-estates.

Country estates which are not situated adjacent to urban areas should be considered with great caution, as it results in permanent residential development in areas that are not integrated with main activity areas. These estates are leap-frog developments that require the extension of services to areas where services should not be a priority and further result in greater commuting distances for the residents of these areas to places of work, education, social facilities and business opportunities. These estates could therefore in fact contribute to

an inefficient spatial form and could be considered to be against the principle of integrated and sustainable development. Strict requirements must be laid down for the provision of engineering services to and within these estates to ensure that it does not lead to environmental problems. The ability to provide services according to the standards set by the municipality is a pre-requisite.

Illegal mining activities in the rural environment must be identified and closed down. All existing, legal mines shall have an environmental management framework including mitigating measures to address visual impact and a rehabilitation programme.

3.2.1.5 Land Use Management around Environmentally Sensitive Areas

Development areas close to and around environmentally sensitive areas should be clearly identified and demarcated in terms of conservation lines, land use potential and interfaces between development and conservation areas. This should be taken up into the Spatial Development Framework(s) for the area.

These demarcated areas should also be made subject to special land use management and development design conditions which are defined as part of the EMF as well as the SDF and included as part of the approval of development applications (i.e. either as part of the zoning conditions or the Conditions of Establishment).

3.2.1.6 Spatial Planning

With regard to the Municipal Spatial Development Frameworks, these documents should be more specific on strategic issues such as urban sprawl, growth management, informal settlement creation, spatial integration etc.

Detailed local spatial development frameworks (or Urban Development Frameworks) are required for key problem areas or strategic development areas. Priority areas are (1) the area between Zithobeni, Bronkhorstspuit and Bronkhorstspuit Dam and (2) the Silver Lakes, Mooikloof, R21 area. These documents should not be mere land use plans, but detailed development plans addressing the overall development of a particular environment.

3.2.1.7 Institutional Capacity

None of the aspects identified under the Management Objectives will be achieved without sufficient institutional capacity to manage development applications, enforce the spatial development frameworks and prevent and address illegal land development.

Current institutional capacity and management in the District and the two Local Municipalities is limited. However, with the incorporation of Metsweding in the City of Tshwane, this could be addressed, in particular relating to the areas adjacent to the existing built-up metropolitan area.

3.2.2 Legal and policy requirements for spatial planning

There exist a multitude of legislation and policies which govern development planning and land use management in South Africa and in Gauteng. The most important of these, which have a bearing on the nature of development planning in Metsweding, are set out in the table below.

TABLE 5: LEGAL AND POLICY REQUIREMENTS FOR SPATIAL PLANNING

	National	Provincial	Local
Legislation	Constitution of the Republic of South Africa, 1996 Municipal Systems Act, 2000 (Act 32 of 2000) Development Facilitation Act, 1995 National Environmental Management Act, 1998 (Act 107 of 1998) National Environmental Management Protected Areas Act, 2003 (Act 57 of 2003) National Housing Act, 1997 (Act no. 107 of 1997) The National Land Transport Act, 2009 (Act 5 of 2009)	Gauteng Planning and Development Act, 2000 (Act 3 of 2000)	
Policy	Millennium Development Goals, 2000 The United Nation's Millennium National 2014 Vision National Spatial Development Perspective National Housing Code Breaking New Ground White Paper on Spatial Planning and Land Use Management, 2001 Comprehensive Rural Development Programme	Gauteng Spatial Development Perspective Gauteng Growth and Development Strategy Gauteng Spatial Development Framework, 2000 plus newly revised Gauteng SDF Gauteng Global City Region Gauteng Agricultural Hubs	Metsweding District Spatial Development Framework, 2006; Nokeng tsa Taemane Urban Areas Spatial Development Framework, 2006; Nokeng tsa Taemane Rural Areas Spatial Development Framework, 2006; and Kungwini Spatial Development Framework, 2010 (draft). Dinokeng Environmental Management Framework Relevant Municipal Integrated Development Plans

Each of these legislation or policy documents contains certain principles which govern development planning. These principles can be jointly summarised as follows:

- Land development must support and facilitate economic growth and development that will contribute to a reduction in unemployment and halve poverty.
- Government investment must therefore focus on areas with economic growth potential.
- Land development must take place in an integrated manner, both spatially and institutionally.
- The use of existing resources and infrastructure must be optimised.
- Urban sprawl must be discouraged and more compact and efficient cities must be promoted. To this end, development must be channelled into nodes and corridors.
- Historically distorted development patterns must be corrected by means of physical and social integration and the redirecting of investment to areas of highest value and accessibility.
- The creation of socially and economically viable and sustainable human settlements must be ensured.
- Land development must support public transport infrastructure and services.
- Economically, socially and environmentally sustainable development must be encouraged.
- Integrated land development in rural and urban areas in support of each other must be promoted.
- Environmentally sustainable land development practices and processes must be encouraged.

3.2.3 Development parameters for spatial planning

The development parameters for physical development deals with how land that is used for development is used in an optimal and sustainable manner. These parameters have been divided into guidelines for urban development and for rural development.

3.2.3.1 Urban Development

The following development parameters shall apply to urban development areas:

- Further outward growth of the built-up areas should not be permitted until such time as a clear regional growth management strategy has been formulated (i.e. joint strategy for Tshwane and Metsweding).
- Optimal densities should be identified for areas within the urban growth boundaries.
- New development should only take place once a well-designed local bulk infrastructure network which is linked to a particular spatial structure and logic for that particular area is in place.
- No leap-frog development (even within the urban growth boundary) should be permitted.
- Development adjacent or close to environmental features should be clearly designed with interface zones (or buffers) between the development area and the conservation feature.

3.2.3.2 Rural Development

The following development parameters shall apply to the rural environment:

- The creation of informal settlements in the rural environment should not be allowed. The in-situ upgrading of informal settlements that are not situated adjacent to existing formal built-up areas should not be allowed.
- Smaller subdivision of farm portions should only be allowed on the periphery of existing towns and suburban areas as a transitional land use between suburban and rural environments. Subdivisions in the remainder of the rural environment should be restricted to practical motivations rather than opportunistic reasons.
- The following principles shall apply when evaluating applications for developments outside the urban edge:
 - Uses should be rural in nature, or should require a rural setting in order to be functional or viable;
 - The development should not require extensive service infrastructure;
 - The development should not have any negative environmental impact;
 - The development should not create possibilities for other developments to establish in the area;
 - Uses that primarily service the local market;
 - Uses which are resource based; and
 - Uses which are located at a defined and approved service delivery centre.
- Typical land uses that can be permitted in the rural environment include:
 - Nature conservation/sensitive natural areas;
 - Agricultural activities and agri-industries that are required to be located at the source;
 - Housing for bona fide farm workers;
 - Tourism and related activities and facilities, provided that the nature, scale, development footprint and appearance of such tourism and related activities and facilities shall be appropriate for and sensitive to the rural character;
 - Conference and training facilities, provided that the nature, scale and appearance of such conference and training facilities shall be appropriate for and sensitive to the rural character;
 - Low Density Country Estates, subject to conditions set out below;
 - Recreational facilities which are essentially rural in nature;
 - Farm stalls, small rural convenience stores and home industries;
 - Farm schools;
 - Resource based industries (legalised industries); and
 - Any other uses that in the municipality's discretion fit in with the character of the area outside the urban edge, provided that such development adheres to the criteria for developments outside the urban edge as set out above.
- The following general principles must apply to the development of rural areas:
 - Local economic development in rural areas must focus on the creation of conditions that are conducive for the formation and maintenance of cooperatives and commonages;

- Housing must be provided for labourers in the rural areas;
- Agri-villages must be promoted throughout the rural areas as a sustainable manner in which to integrate local economic development and residential settlement development;
- Illegal land uses on farm portions, such as industrial and commercial developments that have no direct relation to agriculture, should be eradicated and moved to the urban areas; and
- Mining activities in the rural environment may not be permitted within sensitive natural areas, high potential agricultural areas or near areas of high tourism potential.
- The following conditions shall apply to the development of Country Estates:
 - May only be developed on the periphery of existing urban environments;
 - The gross density of the development shall not exceed 1 dwelling unit per 2,0 (two) hectares
 - The primary focus is the conservation of the natural resource (open space). Conservation in this sense must be seen as conserving open space as a resource in itself. Conservation conditions must be strictly adhered to
 - A Clutter-and-Space layout shall be adhered to. Dwelling units shall be grouped together in as few clusters as possible
 - 50% significant open space (calculated over the gross area of the site); provided that the area reserved for open space may be increased in cases of environmental sensitivity to the satisfaction of the relevant environmental authority.
 - A Strategic Environmental Impact Assessment must determine the open space, the position of clusters, the position of ancillary facilities, roads etc.
 - Conditions to be set for design, character and overall relationship with its environment
 - Strict requirements must be laid down for the provision of engineering services to and within these estates to ensure that it does not lead to environmental problems. The ability to provide services according to the standards set by the municipality is a pre-requisite for approval.

3.3 Management objectives for cultural and heritage resources

3.3.1 Key issues

As a result of the diversity and richness of heritage resources in a relative small area, the Metsweding area has huge potential for heritage development and associated tourism (e.g. Cullinan). The development of heritage resources and tourism has the potential to stimulate economic development in areas that may otherwise have limited prospect of growth and job creation. In addition heritage resources add to the character and uniqueness of place.

Important heritage management objectives to ensure the sustainable long-term conservation, management, development and maintenance of the heritage resources will include the following:

- To promote and increase general heritage awareness throughout the area
- To ensure compliance with the South African Heritage Resources Act (Act No. 25 of 1999) by all sectors (government and private sector)
- To provide institutional support to land owners and communities with regard to heritage management and to encourage stewardship of our heritage resources.
- To ensure the long-term protection of the heritage resources through an open and transparent process.
- To balance opportunities for research, education and tourism without comprising the integrity of heritage resources.
- To interpret all important and relevant aspects of the history of the region.
- To maximize the visitor experience relating to the heritage resources.
- To ensure a balanced approach between development, conservation and utilization.
- To ensure ease of, and limit the cost, of maintenance and management of heritage resources.

Although conservation is site-specific there is an international guiding philosophy with the principle aim to ensure sympathetic restoration and conservation by protecting the academic and social integrity of the site. Guidelines have been drawn up by ICOMOS (the International Council for Monuments & Sites); the most

frequently cited being the Burra Charter (the Australian ICOMOS Charter for the Conservation of Places of Cultural Significance 1988). In summary this states that:

- *place is important*
- *understand the significance of the place*
- *understand the fabric*
- *consult with all stakeholders and reach agreement*
- *significance should guide decisions*
- *retain significant elements*
- *do as much as necessary and as little as possible*
- *interventions should be reversible*
- *copies of original fabric should be identifiable*
- *keep records of decisions and changes to the place*
- *do everything in logical order*

3.3.2 Legal and policy requirements

The South African Heritage Resources Act (Act No. 25 of 1999) deals with all aspects related to heritage, conservation and development in an integrated manner and regulate every aspect related to heritage resources.

The act is administrated by the South African Heritage Resources Agency (SAHRA) as well as the Provincial Heritage Resource Agencies (PHRA). The following key clauses of the act are important for the purpose of this framework:

STRUCTURES

34. (1) No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

ARCHAEOLOGY, PALAEOLOGY AND METEORITES

35.(4) No person may, without a permit issued by the responsible heritage resources authority—

- (a) *destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;*
- (b) *destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;*
- (c) *trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or*
- (d) *bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.*

BURIAL GROUNDS AND GRAVES

36.(3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

- (a) *destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;*
- (b) *destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or*
- (c) *bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.*

PUBLIC MONUMENTS AND MEMORIALS

37. Public monuments and memorials must, without the need to publish a notice to this effect, be

protected in the same manner as places which are entered in a heritage register referred to in section 30.

HERITAGE RESOURCES MANAGEMENT

38.(1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

- (a) *the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- (b) *the construction of a bridge or similar structure exceeding 50 m in length;*
- (c) *any development or other activity which will change the character of a site—*
 - (i) *exceeding 5 000 m² in extent; or*
 - (ii) *involving three or more existing erven or subdivisions thereof; or*
 - (iii) *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
 - (iv) *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*
- (d) *the re-zoning of a site exceeding 10 000 m² in extent; or*
- (e) *any other category of development provided for in regulations by SAHRA or*

a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

3.3.3 Development parameters

Any development within the Metsweding area is subject to the requirements of the South African Heritage Resources Act (Act No. 25 of 1999).

The development of any a heritage resource will is always subject to the development and approval of a Heritage Site Management Plan. Such plans must be in line with the “*Guideline for the development of plans for the management of heritage sites or places*” published by the South African Heritage Resource Agency (SHARA) in 2008.

3.4 Management objectives for agriculture

3.4.1 Management objectives

Due to the relative predominance of moderate to high potential soils in the south and east of Metsweding (mostly in Kungwini), it will be desirable to carefully monitor the zones where good soils occur, in order to preserve such soils for agriculture, both in the context of the District Municipality itself, as well as in the broader aspect. This is likely to be most critical in the vicinity of Bronkhorstspuit/Ekangala, which has been identified as a development node. Where expansion is planned, increased food growing capacity will be required, both for food security and to minimise the need for food to be brought in from elsewhere. Therefore, existing high potential soils in the vicinity need to be preserved.

3.4.2 Legal and policy requirements

Both the National Environmental Management Act (Act 107 of 1998) and the Conservation of Agricultural Resources Act (Act 43 of 1983) require a permit for any agricultural land to be used for another purpose. However, where such conflict occurs close to an existing non-agricultural centre and where there is a significant economic benefit to a development, the pressures on agricultural land can be severe.

3.4.3 Development parameters

The conservation of agricultural production through the sustainable cultivation and use of high potential soils will ensure optimum food, forage and fibre production, both for the region and for South Africa. These provide both an income and employment for a significant proportion of the population.

Several areas to the east and north-east of Pretoria are being developed (or are being planned to be developed) at a rapid rate, so that correct identification of soil types (including high potential agricultural soils, potentially erodible soils, cracking clay soils, rocky soils and wetland areas) is vital for correct, sustainable development.

With reference to the several resource-poor areas in the region, there is a large demand for agricultural produce. In addition, if properly planned and managed, the re-settlement of new, small-scale farmers would lead to the improvement of the well-being of many of the communities in the area.

Although there is not a high erosion hazard in most of Metsweding, especially in the areas where development is likely to occur, any soil will erode if misused, which could lead to long-term damage

3.5 Management objectives for Mining

3.5.1 Management objectives

Mining in the Metsweding area is an important economic driver in the region and can be managed in an environmentally sustainable manner. From a desired state perspective the strategic objective for all new mines must be that:

The post-mining environment must as a minimum mimic or emulates the pre-mining/pre-disturbance environment as closely as possible in terms all environmental attributes and functionality.

In practice this will mean that the mine closure and rehabilitation must amongst others aim to:

- Restore or mimic the vegetative component to the pre-disturbance state (This can be a long term process through natural succession).
- Restore or mimic the pre-disturbance hydrological regime
- Mitigate the visual impact of the mine

Important mine management objectives for the Metsweding district include the following:

- To raise the general awareness of the community and stakeholders regarding the requirements of the Minerals and Petroleum Resources Development Act (Act 22 of 2002).
- To engage the Department of Mineral Resources to establish a task team to deal with mining and the impacts of mining in the district.
- To conduct compliance audit on all active mines in the region and establish the extent of legal and illegal operations.
- To identify un-rehabilitated sites that pose significant pollution threats and prioritize these sites for rehabilitation and remediation.
- To ensure the sustainable and legal extraction of mineral resources in the region.
- To ensure a balanced approach between development, conservation and utilization.
- To ensure ease of, and limit the cost, of maintenance and management of the post mining environment.

3.5.2 *Legal and policy requirements*

Mining and mineral extraction is one of the most regulated industries, with regulations pertaining to every possible aspect from prospecting to extraction, prospecting and closure. The Minerals and Petroleum Resources Development Act (Act 22 of 2002) is the act that deal with mining, followed by sections of the National Environmental Management Act (Act 107 of 1998) and the National Water Act (Act 36 of 1998).

The current mining legislation, including the National Mineral and Petroleum Resources Development Act (MPRDA)(Act 28 of 2002) does not provide adequate legal means to alter mining activities which have been duly authorised by the relevant authority, in the Metsweding area. Only a few environmental statutes (NEMA, NEM:PAA, NHRA) provide for restricted possibilities to expropriate these mining properties or rights, however, only the MPRDA and the NEM:PAA allows for the cancellation of minerals rights. Some of the legislation provides legal mechanisms for the management of environmental impacts from mining activities (e.g. rehabilitation and remediation obligation, development of environmental management programmes and plans, financial securities), and for the full life cycle of the activities. However, such mechanisms cannot be directly used by Metsweding itself as there are usually defined mandates allocated to responsible parties. It is suggested that the Municipality should liaise with the relevant authorities to improve collaboration in terms of the management of mining activities in the area.

NEMA, NEM:PAA, NEM:BA and NHRA do provide various legal instruments which could assist in the regulation of *new* mining activities in the Metsweding area. The NEM:PAA provides for the control and limitation of activities in protected areas according to the type of protected area. Therefore, the Municipality could use one of the instruments to enable the control and limitation of mining activities in the area. The NHRA and NEM:BA also provide for similar provisions in terms of heritage resources and biodiversity management, which could also be used by the Management Authority to limit mining developments in the area.

TABLE 6: IMPORTANT DOCUMENTS DEALING WITH MINING AND THE ASSOCIATED IMPACTS

DOCUMENT / REPORT / GUIDELINE TITLE AND BASIC CONTENT	COMPILED BY	DATE
<p>Standard environmental management programme for the mining of sand from a river, stream, dam or pan</p> <ul style="list-style-type: none"> Provides “guidelines for the preparation of environmental management programme reports for prospecting and mining projects have been compiled to assist applicants for, and holders of prospecting permits and mining authorizations to draw up environmental management programmes (EMPs) in accordance with an established approach, which is acceptable to all the regulating authorities concerned and to secure the approval thereof, as required in terms of section 39 of the Minerals Act, 1991 (Act 50 of 1991).” “This guideline document has been prepared specifically for the purpose of establishing a dedicated Standard Environmental Management Programme (SEMP) for the mining of sand from a river, stream, dam or pan.” 	National Department of Minerals and Energy	
<p>Code of Practice for Mine Residue Deposits</p> <ul style="list-style-type: none"> Outlines the codes of practice for the management of mine residue deposits. 	South African Bureau of Standards	
<p>Guidelines for Environmental Protection</p> <ul style="list-style-type: none"> Provides guidelines for the management of mine residue deposits. 	Chamber of Mines	
<p>Regulations 527 of the Minerals and Petroleum Resources Development Act, Act No. 28 of 2002</p> <ul style="list-style-type: none"> Provides guidelines for the management of mine residue deposits. 	National Department of Minerals and Energy	2002
<p>Water Quality Management Series</p> <ul style="list-style-type: none"> Operational guidelines dealing specifically with mining related issues form part of the M-subseries of the category Management Strategies and Instruments. <ul style="list-style-type: none"> M1.0: Operational Guideline for Control over the Alteration in the Course of a Public Stream. M2.0: Guideline Concerning Financial Provision for the Rehabilitation of Land Disturbed by Mining Activities M3.0: Policy and Strategy of Water Quality Regarding the Mining Industry in the RSA. M4.0: Operational Guideline for the application by a mine for a permit in terms of Sections 12B and 21 of the Water Act (Act 54 of 1956). M5.0: Operational Guideline for the DWAF to assist the DME with Environmental Management Programmes in terms of the Minerals Act. M6.1: Guideline document for the implementation of regulations on use of water for mining and related activities aimed at the protection of water resources. 	Department of Water Affairs	1996 1994 1995 1997 1998 2000
<p>Water Quality Management Series</p> <ul style="list-style-type: none"> Development of Best Practice Guidelines for Water Quality Management in the South African Mining Industry. <ul style="list-style-type: none"> BPG1.1: Integrated Mine Water and Waste Management. BPG1.2: Storm Water Management. BPG1.1: Integrated Mine Water Management. BPG1.6: Water and Salt Balances. BPG1.7: Water Monitoring Systems. BPG1.8: Mine Closure Planning. 	Department of Water Affairs	2004 2003 2000 2003 2003 2004
<p>Water Management Activity Series</p> <ul style="list-style-type: none"> Development of Best Practice Guidelines for Water Quality Management in the South African Mining Industry. <ul style="list-style-type: none"> BPG2.1a: Prevention and Management of Water Pollution from Small-Scale Mining Practices (Standard Format). BPG2.1b: Prevention and Management of Water Pollution from Small-Scale Mining Practices (User Format). 		2002 2002

3.5.3 Development parameters

The development of mines is influenced by three principle parameters:

- Occurrence of the mineral resource (also determines the mining location).
- Extractability of the resource.
- Demand for the resource.

The Metsweding area is rich in mineral resources and the proximity of the area to the Gauteng economic hub makes mining of even small deposits economical. Most of the mineral resources are relatively shallow and are mined through open cast mining that is the most economic method. Only one underground mining operation occurs in the region and even this started as an open cast open cast operation. Collectively this also results in the proliferation of smaller, less formal mines in the region.

Development parameters for mining in the Metsweding area include the following:

- Mining in sensitive or threatened environments must be minimized and impacts of mining on these environments be mitigated.
- The cumulative impacts of mining on the regional hydrology must be carefully scrutinized and assessed prior to approval of new mines.
- Mining and associated infrastructure can only be allowed if the land use is compatible with adjacent uses or were the impact on adjacent landuses can be mitigated.
- Mining infrastructure such as housing, processing plant and ancillary industries must be established in the existing urban hubs to ensure that the infrastructure can be reused once the mine has been decommissioned.
- The establishing of new urban centres and informal settlements as a result of mining must be discouraged.
- Secondary processing of mineral resources must take place in the region to grow the economic resource base of the region and create job opportunities.

3.6 Management Objectives for biodiversity

3.6.1 Value of ecosystem services and functions

Essential ecological services provided by natural vegetation include maintaining the gaseous composition of the atmosphere, running the hydrological cycle, generating soils, preserving their fertility, controlling pests, pollinating crops and detoxifying waste (Salzman 1998) as well as the support of food chains and biodiversity and the provision of raw materials (building, food, medicine) (see Table 7).

TABLE 7: RENEWABLE ECOSYSTEM SERVICES AND FUNCTIONS (CONSTANZA ET AL. 1997)

<i>Ecosystem goods and services</i>	<i>Ecosystem functions</i>
Gas regulation	Regulation of atmospheric chemical composition
Climate regulation	Regulation of temperature and precipitation
Disturbance regulation	Capacitance, damping and integrity of ecosystem response to climate fluctuations
Water regulation	Regulation of hydrological flows
Water supply	Storage and retention of water
Erosion control	Soil retention within an ecosystem
Soil formation	Soil formation processes
Nutrient cycling	Storage, internal cycling, processing and acquisition of nutrients
Waste treatment	Recovery of mobile nutrients and removal or breakdown of excess xenic nutrients and compounds
Pollination	Movement of floral gametes

<i>Ecosystem goods and services</i>	<i>Ecosystem functions</i>
Biological control	Trophic-dynamic regulation of populations
Refugia	Habitat for populations
Food production	Portion of gross primary production extractable as food
Raw materials	Portion of gross primary production extractable as raw materials, e.g. lumber, fuel, fodder
Genetic resources	Sources of unique biological materials and products, e.g. medicines
Recreation	Providing opportunity for recreational activities, e.g. eco-tourism
Cultural	Providing opportunities for non-commercial use, e.g. aesthetic, spiritual, scientific

3.6.2 *Defining the desired state*

Changes in the physical, chemical or biological state of the environment determine the quality of ecosystems and the welfare of human beings. In other words changes in the state may have environmental or economic ‘impacts’ on the functioning of ecosystems, their life supporting abilities, and ultimately on human health and on the economic and social performance of society. The desired state of the environment therefore includes any conditions that will maintain ecosystem goods and services. Specific objectives for natural areas to avoid degradation of vegetation and loss of ecosystem goods and services include the following:

- Ensure sufficient areas of natural ecosystems are maintained to avoid loss of biodiversity
- Ensure maintenance of vegetation cover
- Ensure productive grazing capacity of land
- Where appropriate, for example, in woodlands or forests, ensure maintenance of woody biomass in ecosystems
- Ensure species do not become threatened with extinction or are lost from local ecosystems
- Ensure landscape level species composition and richness is maintained
- Ensure alien plants do not become dominant in parts or the whole landscape

Specific policies for maintaining ecosystems and biodiversity also depend on the conservation status of the habitat in question.

3.6.2.1 *High priority conservation areas*

This includes all existing protected areas, remainder of all “Endangered” habitats, all important ecological corridors and all habitats that have high importance for the conservation of threatened species. In Figure 2, this is equivalent to all those areas classified as having high biodiversity value (red areas). Within these areas the desired state should be as follows:

- Remaining natural areas should be protected and/or enhanced through rehabilitation of degraded components, where possible.
- No further habitat loss should be permitted.
- Only activities with a low impact or no impact.
- Development within these areas should not be permitted.
- Impacts on harvesting of natural resources within these areas should be limited to within sustainable levels.

3.6.2.2 *Intermediate priority conservation areas*

This includes the remainder of all “Vulnerable” habitats and all habitats that have moderate importance for the conservation of threatened species. In Figure 2, this is equivalent to all those areas classified as having moderate biodiversity value (orange areas). Within these areas the desired state should be as follows:

- Remaining natural areas should be protected and/or enhanced through rehabilitation of degraded components, where possible.

- Habitat loss may be tolerated only if there are other environmental offsets.
- Impacts on harvesting of natural resources within these areas should be limited to within sustainable levels.

3.6.2.3 Low priority conservation areas

This includes the remainder of all untransformed habitats within the study area (areas that do not meet the criteria for the previous two categories). There are no areas in Figure 2 that fit within this category. Vegetation on ridges are not endangered or vulnerable, but are important for the conservation of threatened species. Within these areas (if they occur) the desired state should be as follows:

- Habitat loss may be permitted, but not to the extent that loss of ecosystem goods and services becomes significant or to the extent that it leads to a change in conservation status of species or vegetation types.
- Degradation of natural areas should not take place unnecessarily.

TABLE 8: ECOLOGICAL ISSUES AND ASSOCIATED MANAGEMENT OBJECTIVES.

Issue	Objective	Motivation
Loss of natural habitat (including habitat important for threatened plants)	Ensure sufficient areas of natural ecosystems are maintained to avoid loss of biodiversity	The status of a vegetation type is based on how much of its original area still remains intact relative to various thresholds. These thresholds are based on the area required to maintain biodiversity and function, which is a key determinant of the ability of the ecosystem to continue supplying ecosystem goods and services. The vegetation is the primary habitat for wild populations of animals and plants and thus the reservoir of biodiversity.
Loss of vegetation cover (desertification)	Ensure maintenance of vegetation cover	Vegetation cover protects the soils surface from erosion, promotes water infiltration into the soil after rainfall and provides productive biomass to feed into food chains. Loss of vegetation cover is the primary risk factor in facilitating soil erosion, increasing storm-water flow after rainfall events and reducing the ability of the landscape to retain water to feed wetlands. Vegetation (primarily the herbaceous layer) also provides the grazing resource for domestic livestock
Overgrazing	Ensure productive grazing capacity of land	Continued non-selective grazing can lead to permanent change in species composition and loss of vegetation cover to a point where the landscape has a reduced grazing capacity and productive ability. This can lead to soil erosion, increased storm-water flows, reduced water quality in wetlands and a reduction in the ability of the landscape to store and retain water.
Harvesting of woody plants from woodland ecosystems	Ensure maintenance of woody biomass in woodland ecosystems	Loss of woody plants can lead to change in vegetation structure and species composition as well as reduced amount of sequestration of carbon within ecosystems. Trees and shrubs provide food and shelter for various wild populations as well as humans and, on a landscape scale, can ameliorate climate.
Harvesting of medicinal plants	Ensure species do not become threatened with extinction or are lost from local ecosystems	There are a number of species that are important for medicinal reasons and which also form a component of the natural species composition of the landscape. Loss of populations of these species can result in the conservation status of the species being negatively changed. It will also result in the species no longer being available for the purposes for which it is being used.
Change in vegetation	Ensure landscape level	Species composition may change due to various environmental and

Issue	Objective	Motivation
species composition and richness	species composition and richness is maintained	human and/or animal induced pressures. Change in species composition can result in loss of biodiversity as well as a change in the way the landscape functions. Change in species composition can lead to change in vegetation structure which could have various negative consequences.
Invasion by alien plants	Ensure alien plants do not become dominant in parts or the whole landscape	Alien plants replace indigenous vegetation leading to severe loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, etc.

3.6.3 LEGAL AND POLICY REQUIREMENTS

There are a number of National Acts and Provincial Policies that apply to management of biodiversity and ecosystems, as follows:

National Environmental Management Act, Act No. 107 of 1998 (NEMA)

NEMA requires, inter alia, that:

- “development must be socially, environmentally, and economically sustainable”,
- “disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied” ,
- “a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions”,

NEMA states that “the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people’s common heritage.”

Environment Conservation Act No 73 of 1989 Amendment Notice No R1183 of 1997

The ECA states that:

Development must be environmentally, socially and economically sustainable. Sustainable development requires the consideration of inter alia the following factors:

- that pollution and degradation of the environment is avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
- that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and
- that negative impacts on the environment and on peoples’ environmental rights be anticipated and prevented, and where they cannot be altogether prevented are minimised and remedied.

The developer is required to undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the EIA regulations in order to control activities which might have a detrimental effect on the environment. Such activities will only be permitted with written authorisation from a competent authority.

National Forests Act (Act no 84 of 1998)

Protected trees

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that ‘ no person may cut, damage, disturb, destroy or remove any *protected tree*, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister’.

Forests

Prohibits the destruction of indigenous trees in any natural forest without a licence.

National Environmental Management: Biodiversity Act (Act No 10 of 2004)

In terms of the Biodiversity Act, a land manager has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists all vegetation types considered to be threatened.
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

- Category 1 plants: are prohibited and must be controlled.
- Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands.

GDARD Requirements for Biodiversity Assessments

The GDARD “Requirements for Biodiversity Assessments” stipulate that all untransformed grasslands have to be classified as having high sensitivity.

In terms of GDARD requirements, a 30m buffer zone beyond wetland boundaries must be reserved inside the urban edge.

GDARD Threatened Species Policy

According to the GDARD Threatened Species Policy, there are three basic rules of conservation that apply to populations of Red List Plant Species, as follows:

1. All populations of Near Threatened and Threatened plant taxa must be conserved *in situ*.
2. All populations of Near Threatened and Threatened plant taxa must be protected with a buffer zone in accordance with guidelines as set out in below.
 - a. In urban areas, a minimum buffer zone of 200 (two hundred) meters is required from the edge of a Red List Plant Species population.
 - b. In rural areas, a larger buffer zone width is required to protect populations of Red List Plant Species from detrimental edge effects that are active over distances greater than 200 meters, in accordance with their priority grouping, as follows –

- i. in respect of an A1 priority grouping, a buffer zone of at least 600 (six hundred) meters from the edge of the Red List Plant Species population must be allowed;
 - ii. in respect of an A2 priority grouping, a buffer zone of at least 500 (five hundred) meters from the edge of the Red List Plant Species population must be allowed;
 - iii. in respect of an A3 priority grouping, a buffer zone of at least 400 (four hundred) meters from the edge of the Red List Plant Species population must be allowed;
 - iv. in respect of a B priority grouping, a buffer zone of at least 300 (three hundred) meters from the edge of the Red List Plant Species population must be allowed.
3. An Ecological Management Plan must be compiled in respect of all actions that affect populations of Red List Plant Species.

GDARD Ridges Policy

All areas with a slope inclination greater than a defined value are considered in Gauteng to be ridges. Development within these areas is restricted. The restriction is determined by the current state of a ridge, which is determined on the basis of the degree of natural vegetation transformation within the particular ridge system. All ridges in Gauteng have been classified on this basis. Ridges in a higher degree of natural state have a greater restriction in terms of permissible future development. For example, in terms of the GDARD Ridges Policy, A 200m buffer zone of low impact development is required around class 1 ridges.

3.6.4 DEVELOPMENT PARAMETERS

The assessment of alternatives is based on a SWOT analysis, which involves specifying the objectives of the project and identifying the internal and external factors that are favourable and unfavourable to achieving those objectives. The defined objectives for avoiding degradation of ecological / biodiversity resources are as follows:

- Ensure sufficient areas of natural ecosystems are maintained to avoid loss of biodiversity
- Ensure maintenance of vegetation cover
- Ensure productive grazing capacity of land
- Where appropriate, ensure maintenance of woody biomass in ecosystems
- Ensure species do not become threatened with extinction or are lost from local ecosystems
- Ensure landscape level species composition and richness is maintained
- Ensure alien plants do not become dominant in parts or the whole landscape

3.6.4.1 Opportunities

Potential opportunities / strengths include the following:

- Capabilities and competencies within the municipality as well as within Provincial structures provide sufficient human resources for capable management of environmental resources.
- Provincial conservation authorities are committed to active management of biodiversity resources within the province as a whole.
- National legislation (environmental) and Provincial policy is detailed enough to provide a good framework for environmental management.
- Knowledge of existing broad ecological patterns that makes it easy to identify potentially sensitive areas and evaluate habitat condition.
- Cultural attitudes to natural areas are generally favourable.
- Some parts of the landscape are already under conservation protection, e.g. Magaliesberg Protected Natural Environment, conservancies.

3.6.4.2 Constraints

Potential constraints / weaknesses include the following:

- Knowledge of existing ecological patterns is limited to landscape scale. Limited local information exists for the entire study area on distribution of sensitive species or alien species.

- Knowledge of undesirable plants is limited. Management of alien plants often requires expert input to identify problem plants and provide management recommendations.
- Continued population increase, primarily through immigration, increases pressure on the landscape.
- Commitment to environmental management may be shadowed by socio-economic demands.
- There is a lack of awareness of the value of biodiversity resources and the impact of over-utilizing them.
- Mined areas have low biodiversity value and tend to disturb widely dispersed parts of the landscape. It is therefore difficult to contain mining impacts.
- Environmental law enforcement is often inadequate or penalties are insufficient to ensure compliance.
- Mining development often takes precedence over environmental issues, especially when DME are involved in environmental decision-making.

3.6.4.3 Management strategies

There are three main management alternatives for maintaining biodiversity features in the landscape:

- Traditional conservation areas with expansion to include new areas;
- Community-based conservation principles;
- Environmental management zones with limitations on allowable activities.

The expansion of conservation areas of national interest is driven by National Parks Board on the basis of national priorities. Smaller conservation areas may be promulgated due to local needs or driven by private objectives. Such conservation areas could potentially be established to protect valuable local biodiversity resources, but are unlikely to be effective in maintaining biodiversity resources throughout the study area.

Community-based conservation may take different forms. There are a number of conservancies within the study area, which serve a valuable function in terms of limiting loss of natural areas and managing existing areas on the basis of effective conservation principles. However, these are unlikely to limit environmental damage in conflict areas where there is a strong development pressure.

Environmental management zones provide a useful overall strategy for managing biodiversity resources, since these identify valuable features and areas and provide regional-level policies for limiting activities within these areas. They are also linked to specific features and can, therefore, be tuned to specific legislation or issues associated with such features.

3.7 Environmental management zones

Features of high biodiversity importance in the study area include the following:

- Remaining areas of vegetation of conservation importance: this is based primarily on the Draft Ecosystem List and the assessment of the conservation value of vegetation types in the scientific literature (Driver et al. 2005; Mucina *et al.*, 2006) ;
- Red List flora that occur within remaining natural habitats within the study area;
- Areas classified as mountains, ridges or steep slopes;
- Perennial and non-perennial rivers, streams and watercourse;
- Protected trees, protected plants.

These may be treated as environmental control zones in which specific legislation limits activities within these areas

TABLE 9: ENVIRONMENTAL CONTROL ZONES / FEATURES AND LEGISLATION.

Zones / feature	Legislation / policy
Remaining areas of Endangered ecosystems (Rand Highveld Grassland, Marikana Thornveld, Springbokvlakte Thornveld, Eastern Highveld Grassland)	<ul style="list-style-type: none"> • Environmental Conservation Act, • National Environmental Management Act, • National Environmental Management: Biodiversity Act (incl. Draft Ecosystem List), • Gauteng Requirements for Biodiversity Studies (all areas of grassland to be designated as sensitive), • Conservation of Agricultural Resources Act (removal of alien plants).
Remaining areas of Vulnerable ecosystems (Central Sandy Bushveld, Carletonville Dolomite Grassland)	<ul style="list-style-type: none"> • National Environmental Management Act, • Conservation of Agricultural Resources Act (removal of alien plants).
Habitats supporting priority threatened plant species	<ul style="list-style-type: none"> • National Environmental Management Act, • Gauteng Threatened Species Policy, • Conservation of Agricultural Resources Act (removal of alien plants).
Areas classified as mountains, ridges or steep slopes.	<ul style="list-style-type: none"> • Gauteng Ridges Policy, • Conservation of Agricultural Resources Act (removal of alien plants).
Perennial and non-perennial rivers, streams & watercourses, as well as wetlands	<ul style="list-style-type: none"> • National Water Act, • National Environmental Management Act, • Conservation of Agricultural Resources Act (removal of alien plants).
Protected trees	<ul style="list-style-type: none"> • National Forests Act
Protected plants	<ul style="list-style-type: none"> • National Environmental Management: Biodiversity Act.

3.7.1.1 Discussion

There are various features of high biodiversity value in the study area, including threatened vegetation types, plant species of concern and the habitats in which they occur, ridges and mountains, and rivers, streams, drainage lines and wetlands. There are twelve vegetation types that occur in the study area. These vegetation types are classified into different conservation categories based on the degree or transformation and conservation. Four of these were identified as having high conservation status, since they are listed in the Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004) as being Vulnerable and in the scientific literature (Driver et al. 2005; Mucina *et al.*, 2006) as being Endangered. Two other vegetation types are classified in the scientific literature (Driver et al. 2005; Mucina *et al.*, 2006) as being Vulnerable, but are not listed in the Draft National List of Threatened Ecosystems (GN1477 of 2009).

Specific objectives for natural areas to avoid degradation of vegetation and loss of ecosystem goods and services include the following:

- Ensure sufficient areas of natural ecosystems are maintained to avoid loss of biodiversity
- Ensure maintenance of vegetation cover
- Ensure productive grazing capacity of land
- Where appropriate, for example, in woodlands or forests, ensure maintenance of woody biomass in ecosystems
- Ensure species do not become threatened with extinction or are lost from local ecosystems
- Ensure landscape level species composition and richness is maintained
- Ensure alien plants do not become dominant in parts or the whole landscape

There are various National Acts that provide protection to natural features in the study area, the most important of which are the *National Environmental Management Act, Act No. 107 of 1998* and the *National*

Environmental Management: Biodiversity Act (Act No 10 of 2004). There are also various Provincial policies that provide protection to specific features, including the Ridges Policy, the Threatened Species Policy and the Requirements for Biodiversity Assessments, which specifies that all natural grasslands must be treated as sensitive.

There are other measures that could potentially assist in controlling degradation of natural biodiversity in the study area, including the following:

1. Defining and maintaining an urban boundary beyond which urban densification is not permitted to occur,
2. Restricting certain activities within sensitive rural areas,
3. Defining environmental control zones within which an EIA would be triggered in the event of any infrastructure development application.

3.8 Desired State summary

Open space management has to define a biodiversity conservation objective and strategy for Metsweding that deals with the current level of fragmentation and transformation in the municipal area.

On a purely subjective level, the conservation of terrestrial ecosystem features such as topographical diversity (untransformed ridges) and open vistas (untransformed grasslands) will ensure the preservation of environmental quality.

A desired state for surface water resources, including wetlands, entails the preservation of surface water resources in as largely a natural state as possible. Achieving the desired state will, however, rely on interventions outside the study area due to the sources of potable and general surface water being in adjacent municipalities. A catchment-level water conservation strategy is therefore required, but this should also relate to local level ecological preservation. This local protection can be achieved through the maintenance of adequate conservation buffers and rehabilitation of degraded water-related resources.

Water resource planning should make provision for climate change-related impacts by increasing the capacity of natural systems to accommodate the changes, therewith also improving social resilience. Water quality and water treatment need priority attention.

Mining is a critical issue that needs to be addressed. Illegal mining needs to be halted, unrehabilitated mining areas need to be rehabilitated and any future mining activities need to be understood within the development context of the Metsweding area. It is also critically important that mining does not occur, or is very tightly managed where it does exist, in critical biodiversity areas.

Development planning in Metsweding is no different from other municipalities in terms of objectives – improve the level of services provision and socio-economic indicators, and pursue integrated development planning. It therefore becomes necessary to capacitate the persons responsible for spatial and economic planning in terms of environmental sensitivities and opportunities.

All land uses must be given an equal opportunity to compete for land and resources. This implies that rural development should be controlled in a manner that preserves agricultural viability and prevents urban sprawl. Agricultural production should, in fact, be actively encouraged as an important component of the local economic picture. The continued recording and protection of heritage resources will be critical to the local tourism industry, and the maintenance of a local sense of place and history.

4 ENVIRONMENTAL MANAGEMENT ZONES

4.1 Legal context

According to the current EIA Regulations (Regulation 71), an Environmental Management Framework must, *inter alia*,

“...indicate the kind of activities that would be undesirable in the area or in specific parts of the area;”

This is given further legitimacy by section 24(2) of NEMA that indicates:

“The Minister, or an MEC with the concurrence of the Minister, may identify...

(b) geographical areas based on environmental attributes, and as specified in spatial development tools adopted in the prescribed manner by the environmental authority, in which specified activities may not commence without environmental authorisation from the competent authority;

(c) geographical areas based on environmental attributes, and specified in spatial development tools adopted in the prescribed manner by the environmental authority, in which specified activities may be excluded from authorisation by the competent authority...

Provided that where an activity falls under the jurisdiction of another Minister or MEC, a decision in respect of paragraphs (a) to (d) must be taken after consultation with such other Minister or MEC.”

The geographical areas and spatial development tools referred to in section 24(2) are defined in section 24(3) of NEMA:

“The Minister, or an MEC with the concurrence of the Minister, may compile information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes which must be taken into account by every competent authority.”

An Environmental Management Framework primarily qualifies as ‘information and maps’ that inform assessments for environmental authorisations, but may be used to inform the Minister or MEC in terms of the identification of ‘geographical areas’ when interpreted or used as ‘spatial development tools’. The requirement for the identification of geographical areas based on environmental attributes is satisfied through the demarcation of various environmental management zones – i.e. areas of particular contiguous sensitivity or land use that become structuring elements in the final management framework and management plan.

4.2 Identification of management zones

At the core of the Environmental Management Framework lies an integration of the current environmental state of the study area with a future desired state. The current environmental state is depicted as environmental sensitivity and development maps that are compiled on the basis of information generated during the Status Quo phase of the project. In comparison, the desired end state of various features is described on the basis of the ‘desired state analysis’ above.

This sensitivity evaluation is compared with a spatial depiction of the development trends for Metsweding (i.e. ‘Desired State’ mapping), in order to identify potential areas of conflict, a comprehensive spatial planning framework, and an environmental management plan. The process is depicted in Figure 3.

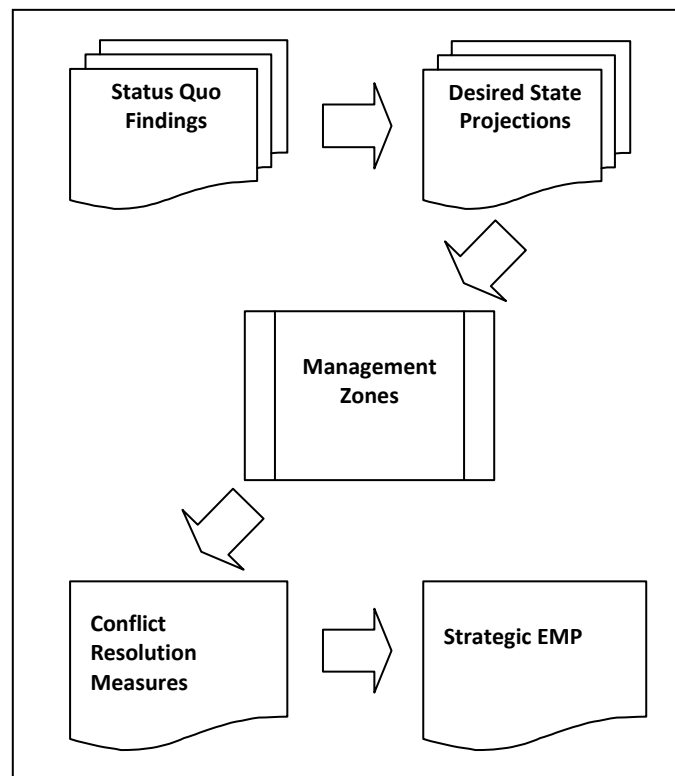


FIGURE 3: The Environmental Framework and Management Plan Compilation Process

The core issues for the Metsweding area have been summarised below; these issues will be refined in the next phase of the project when the environmental management zones are determined.

4.2.1 Sensitive environments

Ecologically sensitive habitats such as nature reserves, primary vegetation types, mountain catchments, rivers, streams, springs, wetlands and ridges must be considered during environmental planning. In this regard, conservation is optimal to spatial arrangement for sensitive natural habitats and corridors; as well as the conservation of other natural vegetation that allows for the maintenance of patterns and processes of biodiversity.

Urbanization should take into account the distribution of sensitive species, the optimal spatial arrangement of habitats, ecosystems and ecological corridors that will ensure continued survival of species, as well as avoiding the disruption of key ecological drivers, such as fire and large mammal herbivory. Urbanization should therefore follow a structured path focusing on the expansion of existing nodes, rather than scattered development across the landscape that leads to transformation and fragmentation of habitats and disruption of ecological processes, such as dispersal, pollination and migration.

In particular, the following environmental constraints on development must be taken into account:

- The highly impacted and transformed landscape, primarily through urban development, agriculture and mining
- The importance of ridges within the study area, particularly towards the central and southern areas
- The importance of wetlands for ecosystem service provisioning
- Existing conservation areas and conservancies in the area, with specific reference to the Dinokeng Project
- The poor water quality and importance of main rivers within the area

4.2.2 Water resources

Water bodies in the area can be considered as another sensitive resource upon which much of the region depends. The areas to avoid, or carefully plan for, include: groundwater recharge zones (e.g. wetlands), ecological corridors and core/representative habitats, and agricultural resources.

The pollution of water bodies and in particular wetlands, is often related to agricultural practices and industrial practices, and can be related to the following:

- Salinisation, nitrification and chemical pollution from agriculture
- Inadequate waste water treatment (particularly around Roodeplaat Dam)
- Mining effluent and untreated return flows, particularly where there are illegal or unrehabilitated mining areas
- Mine Dewatering and Acid Mine Drainage
- Leaching or pollution from refuse dumping and inadequate land fill practise
- Urban effluent return flow (storm water)

Water management should establish conservation, protection and rehabilitation of water bodies such as wetlands, river systems and groundwater. This will need to be initiated by an integrative approach to water use management, as this resource is utilised by and impacted by almost all sectors. Conservation planning should include the identification of the optimal spatial arrangement of corridors, buffers and “stepping stones” that will promote the conservation of water resources, ecological corridors and habitat, and the ecological processes associated with them. The rehabilitation and conservation of these sensitive habitats will ultimately aid, and be strongly linked to ecosystem rehabilitation and maintenance, improvement of land capacity, and optimal groundwater recharge.

4.2.3 Agriculture

Agricultural practices are also often linked to the introduction, and spread of alien invasive species. Therefore a systematic invasive alien control programme that prioritizes infestations based on habitat sensitivity, potential to spread and emerging weeds, should be implemented at a landscape scale. Species that are particularly problematic in Metsweding include the black wattle, blue gum and poplar species.

Improved grazing management systems are required to prevent further degradation of catchments, river systems and wetlands, and thus prevent further degradation of water resources, ecological corridors and habitat. Grazing management systems with rotational camp systems will aid the establishment of sustainable land carrying capacities. Wetlands should also be fenced off where practical, to prevent grazing and trampling by livestock and access by humans

Focus should be placed on agricultural development within the identified GDARD agricultural hubs and assistance to subsistence farmers through educational programmes, networks and development of best practice plans that are suited to local needs and climate. This will improve the efficiency of subsistence farming and aid in community upliftment. Improvement of subsistence farming techniques may also lessen the negative impacts on the natural environment, and improve the communities’ resilience to climate change impacts.

The use of residual biocides and insecticides to control nuisance animals must be reduced through education and extension. This impacts greatly on the survival of faunal species and will aid with improving water and soil quality.

4.2.4 Mining

Mining is an important economic driver in the district (particularly around the Cullinan area), however it is also the main source of strain on ecologically sensitive habitats (e.g. ridges, wetlands, rivers and caves), and sensitive species. Mining in identified sensitive areas should be discouraged entirely, and all proposed new mining locations must be screened through the formal EIA process. Where approvals are granted, adherence to appropriate environmental management plans must be enforced with concurrent rehabilitation rather than rehabilitation at mine closure.

Elimination of illegal mining activities is very important and unrehabilitated mines need to be identified and rehabilitated to a state where there is no further negative impact on the environment. This will have major impacts on the water quality (particularly chemical and sediment) as well as improve areas for biodiversity and other land uses.

4.2.5 Conservation

Areas within the Critical Biodiversity Areas and the conservancies should be managed as core conservation areas. Habitats utilized by Red list mammal species should be afforded the necessary protection against activities that will impact negatively on these species. This should include adequate buffer zones to reduce edge effect and direct disturbance, e.g. wetlands and ridges.

Habitats utilized by priority species should be identified and sufficient representation thereof across the study area must be appropriately managed to mitigate existing disturbances, as well as proposed future developments, in order to prevent further population decline and range reductions. Important ecological corridors should be identified and afforded the necessary protection, if they are to sustain patterns and processes.

4.2.6 Development

Development planning is closely tied to the socio-economic state of the region, and hence should take cognisance of the inherent limitations of the climate, the landscape character, the conflict over resources (e.g. mining versus surface developments) and the relative economic opportunities and advantages of the region.

Densification of existing towns and mining settlements will play a strong role in the improvement of living conditions within the district by increasing infrastructure, service provision and access to these resources. The main idea here is that consolidation of urban settlements can serve a wider community and provide the requisite social and economic services. The growth and development of lifestyle estates along the Tshwane border needs to be controlled and limited to suitable areas. These areas should also take better account of the ability to affordably provide services and link to the Tshwane development plans.

Densification will also address the threat of urban sprawl in the District, and remove pressure on natural resources. Settlements should be managed in such a way to promote efficiency and liveability in the context of infrastructure provision (including the standard of infrastructure), road networks, traffic generation and environmental implications, and counter ad-hoc low intensity and inefficient sprawling development.

Informal settlement development in the district should as far as possible be restricted. Land invasions should be monitored and addressed before settlements become permanent. In-situ upgrading should only take place where these informal settlements are part of or adjacent to an existing urban environment. All informal settlements in environmentally sensitive areas or located in hazardous areas (floodlines, dolomitic areas etc.) should be relocated.

4.2.7 Tourism and Heritage

The Metsweding area is rich in both tourism and heritage assets. Nature based tourism is centred on the Dinokeng and Roodeplaat Dam areas. These areas present a unique opportunity to market and develop the economy in a sustainable manner. Many existing initiatives are already underway and these should be supported by government to ensure their success. Nature-based tourism is possible for the growth of the tourism industry. This could also be used as a way to generate awareness and protection of sensitive/important biological resources in the region.

Cullinan is a major tourism node for the area, supported by Bronkhorstspuit town and dam areas. There are many cultural and heritage resources within the area that have created the tourism value and these should be managed and conserved to ensure the long term sustainability of the tourism industry. An option is for the area

to develop buffer zones around heritage and cultural sites, which prevents or limits activities for the protection of these sites.

5 ENVIRONMENTAL MANAGEMENT FRAMEWORK

5.1 Identification of Environmental Management Zones

The identification of management draws on the information generated during the status quo and desired state analyses, but combines and compares the various layers of information to highlight specific points or areas of convergence or divergence between land uses or state of conservation.

As indicated, conflicts between land uses are identified by comparing the desired state development ideals and trends with the sensitivities that were found during the status quo analysis. Graphically, this process may be represented in a matrix, as shown below. Before final management zones can be demarcated, the various conflicts need some measure of resolution as a form of strategic guidance for development management. Clear strategic guidance will minimise uncertainty in decision-making and give direction to land use planning.

TABLE 10: SPATIAL CONFLICTS IDENTIFIED BETWEEN DESIRED LAND USE AND STATUS QUO SENSITIVITIES

	Ecological	Development	Tourism & Heritage
<i>Ecological</i>		Environmental sensitivities related to ecosystem services and local conservation requirements	
Development planning	Development between Roodeplaat, the N4 and Cullinan Mining activities in the Cullinan area Housing developments along the City of Tshwane East Boundary Development in the Bronberg area Development around Bronkhorstspuit dam		Developments that detract from the sense of place of the Cullinan node Development around Bronkhorstspuit dam
Tourism & Heritage			
<i>Desired State</i>	Agriculture	Agricultural activities east of the Eland River	High potential agricultural lands under demand for housing development
	Infrastructure	Fragmentary linear infrastructure installation	
			Agricultural activities in the DGR

5.2 Resolution of conflicts

5.2.1 Development pressures in sensitive environments

The main development pressures in the district are:

- Eastern expansion of the Temba/Hammanskraal area in the north of Tshwane, which resulted in the development of Steve Bikoville east of the N1 freeway;
- Eastern expansion and pressure emanating from the Zone of Choice along Zambesi Road in Tshwane, resulting in the development of settlements (primarily private residential estates) in the vicinity of the Roodeplaat dam;
- Northern and southern expansion of Mamelodi in order to deal with the housing backlog in Mamelodi;
- Eastern expansion along the N4 freeway, in particular industrial and commercial developments;
- South-eastern expansion of Tshwane's middle to high income areas in the Silver Lakes and Mooikloof area; and
- Southern expansion along the R21 with corridor development in the form of offices, light industries and residential estates taking place along this road.

The areas that experience the highest development pressure (and are expected to continue to experience growth over the next decade or so) are the areas along the eastern boundary of the City of Tshwane, starting with the area to the west/south of the Rietvlei Dam in the south all the way past Mooikloof and Silver Lakes in the Kungwini area and the area around Roodeplaat Dam and Steve Bikoville in Nokeng tsa Taemane.

Some of these developments will be in conflict with key ecological elements within the area. Three main areas of conflict have been identified:

- Infill development in the area between the N1, N4, Cullinan and Roodeplaat
- Development pressure along the eastern boundary with Tshwane
- Development pressure around Bronkhorstspuit dam

5.2.1.1 Infill development in the area between the N1, N4, Cullinan and Roodeplaat

One of the potential conflict points with regard to the development around Cullinan is the municipality's view that development should be permitted along Cullinan Road in the form of infill and ribbon development between the City of Tshwane and Cullinan, as opposed to the current development framework for Dinokeng that seeks to restrict development to existing urban nodes. This is especially evident at the Mahube Valley/Gem Valley gap through the Magaliesberg range where the Mamelodi extensions expand northwards. This node is identified in the Nokeng SDF as an urban hub, yet there are motivations for why the area should not be developed such as a number of sensitive and critical ecological features.

A number of concepts shape the development form in the area between the N1 and Cullinan:

- the consolidation of existing economic nodes
- infill development between nodes
- densification of rural, semi-rural and agricultural properties
- incompatible land uses
- the need to contain urban sprawl by co-locating residential uses, services and employment opportunities
- major transportation links

Unbridled development and infill in this area will result in the loss of the remaining natural open space areas (in public or private ownership). Non-negotiable ecological features in this development zone are wetlands, watercourses, large intact areas of untransformed habitat and corridors between the pristine areas. These elements are not only required in order to maintain the unique biodiversity associated with the particular veld type represented in the area, but also critical for the provision of ecosystem services that form the basis for

sustainable economic development such as game farming, recreational accommodation and nature-based recreational opportunities. These principles apply to the development of high income residential estates along the Metsweding eastern boundary with Tshwane. These specific issues are dealt with in the next section.

5.2.1.2 Development pressure along the current eastern boundary with Tshwane

The areas around Silver Lakes will in future experience even greater development pressure if the proposed development of the new intersection on the N4 (to be developed by a private developer) realises (the so-called Hazeldean intersection). The new Kungwini Spatial Development Framework, 2010 (draft) has also earmarked a considerable urban edge around the Silver Lakes/Mooikloof area, which allows for a total of 26,000 hectares of developed land in this area (of which only a relatively small portion has already been developed). This allows for considerable further eastwards expansion of the urban footprint in the south-western part of the District. This urban edge was earmarked on the basis of the municipality's ability to provide services to new developments over the next five years. The Water Lake Farm residential estate along the Boschkop Road installed bulk water infrastructure from Lynnwood Road in order to service the development, and this has contributed to the opening up of the area for future development.

A major new regional commercial and residential node (the so-called M&T Node) is planned along the R21 in the vicinity of Irene and the Rietvlei Dam. This node will inter alia allow approximately 143,000m² of office space. This development is however currently hampered due to sewerage issues. A second commercial node is also being developed to the south of Mooikloof, adjacent to Mooikloof Ridge.

Other future major residential developments include low cost housing development in Zithobeni, which will almost double the existing housing stock in this area. The new power station that is being developed just east of Metsweding along the N4 has also resulted in an increased demand for residential development around the Bronkhorstspuit area, which has resulted in new township establishments to the south of the N4. New development in the Ekangala area is still hampered due to land transfer issues.

High habitat loss is being experienced due to cultivation and urbanization with alien vegetation affecting water courses. e.g. Bronberg area is under extreme pressure by mining and construction although it has valuable biodiversity. Development pressure around Bronkhorstspuit dam

Established areas are centrally located in the District such as Bronkhorstspuit (including Zithobeni), Cullinan (including Refilwe), Rayton and Ekangala. Most of these areas have experienced fairly limited growth, except for the high growth experienced around the Bronkhorstspuit Dam. This development is typically higher income homes and estates around the dam and linked to the recreational opportunities there. The Bronkhorstspuit Dam area is also important from an agricultural production, heritage and environmental sensitivity perspective.

From a heritage perspective there are numerous important sites in the area. British soldiers are buried on the road to Bapsfontein (from the Anglo Boer War). Numerous Iron Age Sites are also present in the area.

(See the heritage specialist report in the status quo report for full details)

There are high value agricultural lands around Bronkhorstspuit Dam (particularly evident on the eastern side) which due to their high production potential and part of the Kungwini Gauteng Agricultural Hubs should be kept as agriculture.

In addition there are pristine priority biodiversity areas around the dam which should be kept in their natural state and are valuable to Gauteng as a whole.

5.2.2 Guidelines for development within the Metsweding Area (GUIDELINES)

Three development options exist for area:

Scenario A – Maintenance of a rural landscape through strict urban development boundaries tightly wrapped around existing nodes to prevent as much development spread and infiltration as possible

Scenario B – Resignation to the fact that the area is a spill-over from the Tshwane urban area, with no limits to densification, urbanisation or urban land use infiltration

Scenario C – Acknowledgement of the importance of each, and interaction between the different land uses and environmental features, resulting in development patterns that follow a (peri-) urban design framework which designates critical elements and locations as well as optimal spatial design.

The current development trends in the area indicate that there is a strong drive for urban expansion into this area, as evidenced by the spill-over of Mamelodi to the north of the mountain, rapid densification of the Roodeplaats node as well as along the boundary with Tshwane and ribbon development along the road links

A complete submission to unbridled development through a *laissez faire* development approach will bring its own complications though. The Roodeplaats area represents the edge of the urban development of the Tshwane urban area. This implies that a limit should be placed on the expansion of urban uses, in accordance with planning practice that advocates the consolidation and compaction of urban development. At the same time, however, consideration should be given to the natural urban to rural transition area which necessarily consists of a progressively lower intensity and density of landuses, as well as equal recognition for rural uses and accommodation of the remaining sensitive environmental features.

With the impending incorporation of most of Metsweding into the Tshwane Metro, the need and opportunity to manage development according to a more established urban planning regime arise. In particular, it offers the opportunity to impose development controls similar to those currently enforced in the Tshwane area, as well as an incentive for a more global perspective on planning. The compilation of an urban and spatial design framework is therefore both desirable and pro-active as it would give structure to the densification and urbanisation of the focus area without compromising the integrity of the environmental and social networks.

Considering the inevitable development, means to allow the conflict resolution between urbanisation and ecological sensitivity can be enhanced. These could include:

5.2.2.1 *Buffer zones*

The purpose of buffer zones is to reduce the negative impacts of one land use on an adjacent use. This may be achieved through hard, impervious barriers, or filters that progressively reduce the penetration of the undesirable effects. Buffers will therefore differ in size and nature, depending on how rapidly the effects need to be reduced, and the nature of the undesirable effect. In the focus area, a strong emphasis will be placed on buffers that will reduce the effect of development and urban land uses on more natural open spaces, but the opportunity will also exist to use open spaces themselves as buffers between incompatible land uses such as industrial and residential activities.

5.2.2.2 *Avoiding incompatible land uses and encouraging compatible land uses*

Local authorities must pro-actively identify individual land uses or land use categories that are incompatible. The spatial planning on the part of the authorities must then spatially segregate these in the landscape instead of waiting for the conflicts to arise first. Pro-active spatial planning in the form of Local or Regional Spatial Development Frameworks will provide upfront guidance to developers and authorities alike on where certain types or classes of development will be allowed. As a result, the planning of services infrastructure will be simplified since there will be a better understanding of the related capacity requirements. Naturally, it also becomes possible to cluster developments with similar resource and services needs, thereby making the provision of bulk resources such as water and the removal of waste products more cost-effective, and easier to fit into the overall land use pattern.

5.2.2.3 *Clustering of development*

In cases where the actual development (transformation) footprint is less than the total extent of the development or property, it becomes possible to separate development and open space within the same development project. This is achieved through a concentration of development activities in order to allow for

larger intact untransformed areas. At the same time, should development be directed to previously disturbed areas such as cultivated fields or mining areas, the landscaping and construction can occur in-between the remaining untransformed areas that still offer natural habitat and refugia for wildlife. The application of this principle in appropriate areas would pre-empt the envisaged incorporation of the area into the City of Tshwane's municipal boundary, as the City already implements such a 'cluster-and-space' policy in semi-rural and rural areas. 'Appropriate' areas implies locations where local untransformed open space must be preserved, and the development density can be lower than what is found in typically urban areas. Critical ecological areas must be preserved with their ecological functioning intact.

5.2.2.4 Integrated municipal services planning and installation

Generally speaking, any integration of cost-intensive capital projects will result in savings. For instance, in the case of the installation of underground ducting or piping, the integration of the design and actual works with road upgrade projects will improve the long-term viability of the road structure and limit the number of times that the road will need to be excavated for further services installations. The consolidation of services servitudes further reduces the amount of space required, opening up more land for development.

5.2.2.5 Low impact development

Integrated planning can also offer opportunities for more environmentally responsible designs – so-called 'low impact development'. This involves the use of infrastructural and landscaping features for the promotion and optimisation of urban ecosystem functioning. Road verges, for example, may be used as grassed swales in order to improve stormwater management capacity and groundwater recharge. Planning service networks over a large area will also avoid patch-work designs that require the installation of multiple points of failure (e.g. numerous sewer pump stations due to the developments obstructing the use of gravitational flow along natural slopes).

5.2.3 Mining in sensitive areas

Surface mining and areas of conservation importance are mutually exclusive for the simple reason that surface mining denudes large areas of vegetation and soil cover, changes the hydrological regime (both subsurface and of watercourses), and encourages erosion and invasive vegetation. This disrupts ecosystem processes completely, and in most cases permanently. Mining is also reliant on large amounts of water for the resource extraction and processing, and responsible for the release of waste water contaminated by sediment, heavy metals and other chemical components. The only area of convergence between the two land uses exists in the form of untransformed mining properties such as those found adjacent to the Cullinan mine. These usually represent valuable additions to the overall conservation area stock even if they are undermined.

Mining and tourism are both important economic activities within Metsweding and both hold potential for future development through the presence of minerals in the area and the cultural and natural tourism assets. Planning activities within Metsweding will always need to balance both of these activities and their incompatibility.

Conservation can not be deemed more important a land use than mining, and can not be 'moved' to more convenient locations. Unfortunately, in view of the nearly absolute incompatibility of the two land uses, either the one or the other must be allowed on any given piece of land.

A consistent approach towards mining activities and approvals, however, requires the cessation of all illegal mining activities in order to encourage compliance with the legal requirements for ongoing management, monitoring and rehabilitation of approved mining operations. Authorities tasked with the regulation of mining, water use and land use activities must carry out their responsibilities and act against these mines. Furthermore, mutual recognition between the planning, environmental and resource extraction authorities is required where new mines and mine extensions are considered.

5.2.4 Environmental sensitivity in the agricultural hubs

There is an overlap (conflict) between areas designated as part of the Nokeng tsa Tsemang, Kungwini and Bapsfontein Agricultural and the areas that are designated as ecologically sensitive. Within the agricultural hubs, cultivated lands are matched to large expanses of fertile soil and the availability of water for irrigation, and are located close to agricultural support networks as well as markets.

Agricultural cultivation and preservation of untransformed biological diversity are mutually exclusive, since cultivation activities remove the primary vegetation and change the characteristics of the soil and hydrology. Cultivated land can not be restored to primary grassland on a human timescale. At best, a lose-lose scenario where both land uses are compromised in a mixed-use landscape will result, especially where trade-offs are prevalent.

As both the Gauteng Bioregional Plan and the Agricultural Hubs are modelled at a regional level, a fine scale analysis might be necessary to determine where the respective agricultural and cultivation values lie. It is therefore necessary to consider the needs of each land use, in order to determine the possibilities for co-existence, based on shared needs or mutual benefit. These, in conjunction with areas of specific conflict can then be used to define a fine grain spatial and operational plan for the agricultural areas.

TABLE 11: ISSUES RELATED TO THE CO-EXISTENCE OF AGRICULTURE AND SENSITIVE ECOLOGY

<i>Issue</i>	<i>Agricultural need</i>	<i>Ecosystem services</i>	<i>Ecosystem need</i>
<i>Some congruence (enhance the mutual benefit)</i>			
<i>Current state</i>	Existing fields	Transformed areas Large tracts of invasive species	Habitat diversity for seasonal migrations (not necessarily relevant here, as a cultivated landscape is undiversified)
<i>Water and watercourses</i>	Water for irrigation including <ul style="list-style-type: none"> • extraction from river • dams and weirs • boreholes • canals 	<ul style="list-style-type: none"> • Groundwater recharge • Ecological reserve • Water purification 	<ul style="list-style-type: none"> • Natural corridors linking larger vegetation units (large scale, long term as well as short term ecological processes) • Some ecological links may be critical (Ecological Support Areas (ESAs) within the Gauteng Bioregional plan) • Buffering from chemical pollution (fertilisers, biocides) • Some restoration can be particularly important
<i>Agro-chemical use</i>	<ul style="list-style-type: none"> • Pest control • Fertilisers 	<ul style="list-style-type: none"> • Predators • Balancing factors (e.g. diverse habitats to make pest competitors more resilient) 	<ul style="list-style-type: none"> • Habitat diversity for biodiversity, ecological function and resilience • Buffering from the chemical pollution (fertilisers, biocides) • Responsible use of chemicals and GMOs
<i>Soil erosion</i>	Soil protection		<ul style="list-style-type: none"> • Soil protection • Production methods that conserves water and protects against soil erosion such as zero till, crop rotation, contour planting • Ground cover underneath elevated crops (trees)
<i>Game</i>	Large game farm areas	Habitat/ grazing/ foraging	Full spectrum ecological system

<i>Issue</i>	<i>Agricultural need</i>	<i>Ecosystem services</i>	<i>Ecosystem need</i>
<i>Conflict (Mitigation and trade-offs required)</i>			
<i>Land fragmentation & Agricultural extension</i>	New fields		Large unfragmented spaces
<i>Infrastructure & access</i>	<ul style="list-style-type: none"> • Access roads • Electrical reticulation • Water supply 		<ul style="list-style-type: none"> • Permeable fencing • No ruts • No roads through wetlands • Limited levels of activity
<i>Intensive animal farming</i>	Intensive animal farming can be independent of good soils, but may need pastures, as well as fodder and grain crops		<ul style="list-style-type: none"> • Wastewater management • Control of nutrient overload
<i>Extensive animal farming</i>	<ul style="list-style-type: none"> • Large areas for grazing • Disease free areas and game 	Grazing areas	Disease free stock

The only feasible solution is a fine grain analysis of where there are specific sensitive ecological features (wetlands, ridges, rivers and intact sections of primary grassland larger than 5ha), benchmarked against the Gauteng Bioregional plan and to generate an open space system for the zone. Such an analysis will provide more practically useful information than the Dinokeng-wide analysis used for the Desired State and management zone analysis.

The detailed analysis will indicate where agricultural activities must be excluded from the open space area. The designated agricultural areas can then be managed according to specific environmental management controls (mitigation measures).

5.2.5 Specific agricultural activities in the DGR

The DGR area is envisaged as a conglomerate of relatively untransformed private and state land that can be managed as a single entity in order to sustain viable populations of game species for the purposes of nature-based tourism and recreational activities. As shown in the analysis of the conflicts between commercial agriculture and ecological function in Table 11, both cultivation and animal husbandry may represent areas of potential incompatibility with the DGR desired state. However, the level of disagreement is dependent on the intensity of the farming activity and the nature of the farming practices.

Game farming is fully compatible with the DGR concept, but will require co-operative game management that includes and involves all the affected game owners. In this regard, the activities can be managed by means of an overarching environmental management plan which is made binding on participants in the scheme. Non-participants can be accommodated through the already implemented 'island farm' concept – the exclusion fencing of individual farms within a larger conservation entity. The only two requirements would then be co-operation between land users in terms of veld management (fire regimes, water extraction) and disease control.

Extensive stock farming will be problematic in terms of disease control, as there are serious risks of vector and pathogen transfer between livestock and game. Again, the island farm concept will need to be implemented in order to separate game and livestock. Buffer areas might be necessary to avoid the transfer of disease vectors, and the transportation of animals during risk periods must be managed in a way that minimises the risk of contact. However, strict control will be required in terms of disease control. The bulk of the responsibility will unfortunately be on the part of the livestock farmer as the measure of control over the domesticated animals is so much greater.

In terms of crop farming practices, all the potential conflicts of Table 11 apply. Consequently, a judgement call on the appropriateness of cultivation within the DGR needs to be made, based on whether or not crop farming

would support the objectives of the DGR to the extent that the impacts of farming activities would be tolerable. This judgement call may take the form of a general principle (farming being acceptable or not), or as separate approvals for individual farms. A blanket decision might be possible, whether as part of the management plan for the reserve, or as a legislated regulation should the reserve obtain official protected area status. However, this might be short-sighted in consideration of the fact that there might be specific conditions under which cultivation may proceed, or specific requirements for cultivation of crops in support of the DGR. Specific conditions under which cultivation may be allowed should be guided by the analysis in Table 11.

5.2.6 Fragmentary linear infrastructure

Establishing and managing linear infrastructure (e.g. roads, pipelines and transmission lines) have a range of impacts on the natural environment. The impacts can be classified as direct disturbance, edge effects and habitat fragmentation.

5.2.6.1 Direct disturbance

The installation of linear infrastructure in natural environments necessarily requires the disturbance of long sections of natural habitat, soil and geological structure modification and even interference with stream ecology and dynamics. These impacts have the obvious effect of killing plant and animal life in the direct path of the disturbance, but also lead to secondary impacts such as weed infestation, habitat degradation, erosion, changes in groundwater dynamics etc. Although some recovery is possible, the full restoration of grasslands (as are present in the study area) can only take place on geological time-scales. The recovery of vegetation and soil structure may be insignificant though, since subsequent maintenance, replacement or capacity increases would require that the disturbance be repeated.

5.2.6.2 Edge effects

The Status Quo report highlighted particular edge effects of invasive alien species and pollution. Any form of disturbance regime within a natural habitat will result in impacts that radiate outwards from the point of disturbance. The impacts are jointly called 'edge effects' and may include the spread of invasive species, changes in microclimate and changes in species composition due to the change in habitat and life process opportunities. Edge effects effectively extend the overall environmental impact of any infrastructure project beyond the immediate transformed servitude area, and perpetuate the impacts even after the initial disturbance has been rehabilitated.

5.2.6.3 Habitat fragmentation

The transformation during construction, operational factors and maintenance or upgrade requirements of linear infrastructure jointly result in the servitude area becoming a fragmentary influence in the landscape. For example, most servitudes need to be maintained in a treeless state in order to prevent damage to the infrastructure elements and this differentiates the servitude from the rest of the habitat. The movement of species across this break in the habitat might subsequently be reduced. Similar effects are associated with fencing, high volume road traffic, non-mountable kerbing, etc. The more fragmented a habitat, the lower the resilience of the species found in the area, due to disruption of migration routes and isolation of genetic clusters.

The extension, operation, continued maintenance and upgrading of linear infrastructure will necessarily be required for the further development, especially for the infill development in the south, and tourism activities further north. It is also inevitable that the services will intersect sensitive environments. Since coordinated and appropriately managed development is actively encouraged in the area, the associated infrastructural impacts need to be considered and planned for at the same time.

Many environmentally responsible development principles can be applied to ensure that infrastructure has the minimum impact on the natural environment. These would include appropriate design, siting and alignment, servitude management, and in some cases retrofit of existing infrastructure.

5.2.7 *Sense of place in Cullinan*

The town of Cullinan is singled out within Metsweding EMF due to its unique economic, and specifically tourism values. The town of Cullinan represents one of the strongest tourism nodes, not only in Metsweding, but in Gauteng as a whole. Tourism and recreation needs to optimise and harness the existing image and further potential of Cullinan.

In recent years Cullinan has become attractive as a dormitory town in support of Rayton and the City of Tshwane. The result is a rapid urbanisation rate, with associated non-tourism related functions and services such as shopping centres. Transformation of the rural and historic nature of the town risks damaging the sense of place that is associated with the mine and its related tourism functions, whilst traffic congestion and general infrastructure overload detracts from the visitor experience.

It is necessary to consider the future of Cullinan within the bigger context, namely its location within the broader Gauteng, as well as imminent incorporation in the City of Tshwane municipal area. This perspective offers the opportunity to define whether preservation of the heritage and tourism function in the town has enough merit to hold its own against other development pressures and if so, which development controls need to be put into place to protect this function. These sentiments are also echoed by the Metsweding Local Economic Development Framework which acknowledges the Roodeplaas and Cullinan hubs as particular areas where tourism development potential can be realised.

Tourism-focussed development associated with diamond mining, Victorian history and rural living, is therefore the priority for Cullinan. Urbanisation therefore needs to adapt to the tourism development priority.

Key guiding principles whereby the 'urban' residential function can be made more compatible with the tourism focus are:

- Recognition of, defining and maintaining the sense of place;
- Protecting the architectural character as per the Nokeng Tsa Taemane Development Guidelines;
- Screening urban functions from tourists;
- Defining an urban edge;
- Development structuring that will facilitate tourism in designated tourism zones, visitor engagement and information access; and
- Strategies for the preservation of characteristic features linked to heritage legislation.

6 ENVIRONMENTAL MANAGEMENT ZONES

From the spatial analysis and the discussion of land use conflicts, it becomes possible to define spatial demarcations in the form of seven Management Zones:

8. Dinokeng Game Reserve Zone
9. Dinokeng Rural and Rangeland Zone
10. Rural Zone
11. Agriculture Zone
12. Development Corridors & Consolidation Areas
13. Recreation Zone
14. Biodiversity Zone

As is evident from **MAP 1: Environmental Management Zones** within this report, not all the zones are contiguous. Development guidance and controls in the zones do not necessarily need to be limited to specific spatial locations, and therefore spatially segregated 'zones' may be employed. In addition, it may be found that some of the zones overlap to some extent. In such cases, the nature of the overlap is identified and management options defined in order to steer development decision-making.

Note: The Metsweding EMF area does overlap with the EMF which has been completed for the Dinokeng area. In order to ensure alignment and that there are no conflicts, the zones within the area already under the Dinokeng EMF will remain the same. The only refinements are with new data that was made available on the Gauteng Agricultural Priority Area (GAPA) project and the recently published CPlan 3 linked to the draft Bioregional Plan for the City of Tshwane. The only zone this affects is the "Dinokeng Rural South" Zone that now has finer scale detail on important agricultural and biodiversity areas.

The sections below describe in detail the various management zones.

6.1.1 Dinokeng Game Reserve Zone

The DGR is, arguably, the most obvious management zone. It represents the northern parts of the Dinokeng Project Area, and has generally been accepted as the future state of (most of) the properties within its boundary. The DGR is envisaged as a public-private partnership development focussed on a nature-based tourism experience. Public funding will be used to facilitate the development, management and coordination of the project, whilst private land-owners will retain their property rights and contribute to the tourism products on offer.

Comments received during the first round of public participation for this EMF project indicate that there is support for the initiative from the landowners, whilst the development plans for both Nokeng Tsa Taemane and Metsweding municipalities acknowledge it as a key trigger for economic development. Currently, an initial phase of the DGR roll-out has been fenced off in the Ditolo/ Kwalata area, but plans for the expansion areas are moving ahead.

The DGR management zone is therefore designated as the fenced off 'start-up' area, as well as the phase two and three expansion areas that are nearing final management agreement.

6.1.2 Dinokeng Rural and Rangeland Zone

There are extensive areas of privately owned grazing and game farms surrounding the core DGR area or interspersed between the various start-up areas. These fulfil a vital buffering function by limiting encroachment onto the DGR and promoting ecological integrity. The Dinokeng Rural North area is designated as those lands that fall between the DGR and the project boundaries to the north, or the Moloto Road/R568

corridor in the south. The rural areas south of the R568 are different in character and are surrounded by a finer mosaic of land uses, thus are separated into its own management zone.

6.1.3 Rural Zone

The rural areas south of Moloto Road, that are not core biodiversity areas (CPlan 3) or high potential agricultural areas (GAPA Study) constitutes areas without a particularly distinct character. Some settlements and farming areas fall in this category, as does some mining land and large parts of the various conservancies. These areas are, however, important within the Metsweding context as they play a dominant role in determining the character, and sense of place, of the area. A strong rural focus should therefore apply, with management guidelines that can guide rural development.

6.1.4 Agriculture Zone

Game farming will dominate in the northern areas towards the DGR, and stock farming will remain interspersed in the land use mixture of the Dinokeng Area. Yet importantly, there are high potential soils and productive agricultural lands (particularly suited to cultivation) towards the south and east of Metsweding. This is where fertile soils and water for irrigation purposes, and hence also one of the provincial agricultural hubs.

Agricultural activities play an important role in both employment creation and food security, and should therefore be encouraged. It also creates a local sub-economy focussed on providing specialised agricultural services such as farming implements or transportation services. The envisaged developments in tourism and recreation offer opportunities for growth in the local agricultural sector.

A particular concern in the Agriculture zone is, however, the overlap with areas of ecological sensitivity. A careful balance needs to be struck between the consolidation, expansion and operation of agricultural activities on the one hand, and the need to maintain and conserve a viable network of ecologically functional open spaces in this zone.

According to the Gauteng Agricultural Potential Atlas high potential agricultural land is defined as: "Having the soil and terrain quality, growing season and available moisture supply needed to produce sustained high yields of crops economically when treated and managed according to best possible farming practices" (Land Capability report, 2006). The approach of GDARD is to protect land that has been identified as high agricultural potential from development, for the exclusive use of agricultural production.

Within the Agriculture Zone, the GAPA policy and requirements will apply.

6.1.5 Development Corridors & Consolidation Areas

Consolidation of development should occur in existing built-up nodes, in order to maximise the utilisation of services infrastructure through intensification of land use. Applicable areas are existing settlements and towns, such as Cullinan, Rayton, Moloto, Rust-de-Winter and Vaalbank. Community services in consolidated areas have a better chance at reaching the most needy community members, and automatically also find a location with good public transportation access. Control over the rate and nature of consolidation can provide municipal (and other) planning with the necessary projection data to inform bulk services planning.

Consolidation also implies a certain amount of infill development, such as will be the case between Cullinan and Refilwe, and Cullinan and Rayton. Appropriate infill will not require undue infrastructural expansion, yet contribute to the overall spatial functioning of a built-up node.

Consolidation areas are therefore designated between Moloto and KwaMhlanga, Refilwe and Rayton (and beyond to the N4), south-west of the Roodeplaat railway line and along the eastern boarder with the current City of Tshwane boundary. The development spine demarcated by Nokeng tsa Taemane Municipality along the R513 between Roodeplaat and Cullinan is not supported. Whilst the R513 has development potential, it does

not warrant designation as a consolidation area as there is no immediate need for development along the road².

Caution should therefore be applied not to allow development to take place in a haphazard and leap-frog manner along this route. Development along this road must be of a low intensity, as a gradual expansion from the existing urban areas in Cullinan on the one end and the urban areas to the south of Roodeplaat Dam on the other end. Intensive commercial and residential development must be located within Roodeplaat, Cullinan/Rayton and Mamelodi proper where service infrastructure, transportation and the highest density population are present.

The Moloto corridor already functions primarily as a mobility spine, yet even with the development of the proposed rail corridor it will merely retain its function as one of the main access routes to the DGR as opposed to being a development spine. One particular area of concern and contention is the DeWagendrift resettlement project. Other considerations aside, this settlement project can not be supported from either a spatial planning or environmental perspective as its location is not conducive to sustainable urban development.

Development has intensified towards the west of the district in the sections bordering the City of Tshwane and it includes both low-income and high-income developments. The scattered location of settlements across Metsweding has a negative impact on the efficient and sustainable spatial development of the municipality, as settlements are not focused around strategic locations that can be incorporated into a network and hierarchy of places and infrastructure. The largest settlement trend in the District is the development of private residential (security) estates predominantly in the western area adjacent to City of Tshwane which gives an unbalanced impression. The two local municipalities do not have sufficient resources to manage illegal land uses which include residential, industrial and commercial developments in terms of the town planning legislation.

6.1.6 Recreation Zone

Tourism offerings will naturally gravitate towards specific nodes of heritage value or scenic appeal, and tourism activities. These nodes will benefit from shared marketing responsibilities, services and information. The overall management of the Metsweding area will also benefit, since clusters are simpler to integrate into management strategies than a multitude of individual facilities. Examples of identified nodes are Roodeplaat Dam, Bronkhorstspuit, Boekenhoutskloof and Cullinan, but some clustering in the DGR area is also possible.

Roodeplaat Dam and Bronkhorstspuit Dam represent the two main recreational hubs within Metsweding. Both areas are home to watersports, game farms, resorts and all manner of outdoor activities. The large number and diversity of offerings is facilitated by a location that is very accessible from the Tshwane area, and a growing local market. Clustering mainstream recreational activities around the dam has benefits for tourism to Dinokeng such as better utilisation rates for services and integration of activity packages.

6.1.7 Biodiversity Zone

The biodiversity zone is based on the on Critical Biodiversity Areas designed and described in CPlan3 (Compaan and Pfab 2010), a systematic biodiversity plan developed by the Gauteng Department of Agriculture and Rural Development (GDARD), this in turn has been used to describe the draft bioregional plan for Tshwane (2011). Bioregional plans are legislated through National Environmental Management: Biodiversity Act (No. 10 of 2004).

Definitions are (Holness and Skowno, 2011):

² Further explanation and motivation for this recommendation is presented in section 5.2.1.

Critical Biodiversity Area: Any terrestrial or aquatic area required to meet biodiversity pattern and/or process thresholds. These include any area that is required for meeting pattern thresholds, namely remaining areas of Critically Endangered vegetation types and areas required to protect threatened species; any area that is required for meeting process thresholds such as areas important for climate change adaptation; and hydrological process areas such as high priority wetlands and catchments, pan clusters and pans within priority catchments. In addition to the above areas where there is little or no choice of area identified, CBAs include all 'best design' sites in terms of meeting pattern and process thresholds, identified by the iterative conservation planning process. 'Best design' refers to an identified network of natural sites that meet pattern and process thresholds in all vegetation types and features in a spatially efficient and ecologically robust way, and aim to avoid conflict with other activities (e.g. economic activity) where it is possible to achieve biodiversity thresholds elsewhere.

Ecological Support Area: Supporting zone required to prevent degradation of Critical Biodiversity Areas and Protected Areas. These include remaining corridor, catchment, wetland and other process areas that are required to prevent degradation of Critical Biodiversity Areas and formal Protected Areas; and areas which would otherwise have been identified as CBAs except that have been transformed or degraded, but which are currently or potentially still important for supporting ecological processes e.g. floodplain areas that are transformed or degraded. These areas are a focus for rehabilitation rather than the intensification of land uses.

The draft Bioregional Plan for the City of Tshwane (incorporating the Metsweding area) recommends that the EMF should integrate Critical Biodiversity Areas and other relevant guidelines and recommendations from the bioregional plan. This biodiversity zone incorporates as much of the draft bioregional plan layers (same as CPlan 3) into the EMF as possible, however, some of the Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), particularly south of the N4 are in conflict with the Gauteng Agricultural Potential Atlas (GAPA) as well as on transformed land. In these cases the CBAs have been omitted from the biodiversity zone.

7 STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN

7.1 Purpose and scope of an SEMP

The actual implementation component of an EMF is the Strategic Environmental Management Plan. This plan is constituted by the guidance that originates from the Status Quo and Desired State analyses, in conjunction with new intervention strategies that are required to achieve a consistent and effective implementation of the management zones.

According to the Department of Environmental Affairs and Tourism (DEAT, 2004):

“An EMP that has been developed where a SEA framework exists should help to establish a sound planning and management framework. This EMP is known as a Strategic Environmental Management Plan (SEMP). The SEMP provides the framework for addressing cumulative impacts of ongoing developments through a spatial approach to mitigation, monitoring and management... SEAs highlight key issues of concern in the sector or region, whilst SEMPs may prescribe standard approaches to project design and mitigation through environmental guidelines and monitoring requirements. This reduces the scope of work for individual EIAs and detailed EMPs for projects. SEMPs have increasingly been used in South Africa to provide management frameworks to guide development. The SEMP provides the means to incorporate environmental objectives into development decision-making processes.”

All environmental management plans aim to provide guidelines that will enhance the positive aspects of a project and prevent undue adverse impacts on the environment. On a strategic level, however, an SEMP needs to guide management planning and decision-making as opposed to specific activities in order to reach certain environmental targets. The objective of the Metsweding SEMP is therefore to provide decision-making criteria and guidance on management activities that will steer the overall development of the Metsweding area towards the identified desired state parameters.

The management plan will consequently focus on the identified desired state themes, but will identify specific activities that should, or should not, be present in the various management zones:

- Activities that are generally acceptable, and conditions under which they will be deemed acceptable;
- Activities that are incompatible;
- Particular sensitivities that will occur in scattered locations that require acknowledgement, management, development controls and buffer zones. For example, in all the zones, locations of specific sensitive or endangered fauna & flora or habitats would require appropriate buffer areas. These would include Red Data Flora (policy application), Bullfrogs, *Ichneustoma stobbiai*, Pythons and Karst systems (caves); and
- Infrastructural development that is required in order to achieve the Desired State.

In addition, and in order to comply with general requirements for EMPs, the Metsweding SEMP will address:

- Compliance with regulatory requirements and guidelines
- Feedback for continual improvement in environmental performance
- Definition of the environmental management objectives to be realized in order to enhance benefits and minimise adverse environmental impacts
- Description of the detailed actions needed to achieve these objectives, including how they will be achieved, by whom, by when, with what resources, with what monitoring/verification, and to which target or performance level.
- Mechanisms must be provided to address changes in the project implementation, emergencies or unexpected events, and the associated approval processes.

- Clarification of institutional structures, roles, communication and reporting processes required as part of the implementation of the EMP.
- Description of requirements for record keeping, reporting, review, auditing and updating of the EMP (Monitoring)
- Requirements for, and details that should form part of, application processes for individual development activities (e.g. EIA requirements)
- Limits of acceptable change

7.2 The different tiers of environmental decision-making

Environmental decision-making by authorities will either be of a day-to-day development application type, or require determinations of a more strategic nature. The SEMP needs to provide guidance for both, and hence is structured in a way that provides principled direction as well as specific guidance.

For day-to-day development application decisions (such as EIA or town planning applications) the SEMP provides very specific guidance on an 'if this, then that' basis, according to the applicable issue or management zone. Guidelines at this level have to be detailed enough to put lower level technical staff in a position to decide on straightforward routine applications without the need for in-depth consideration and trade-offs between issues. For this particular purpose, two sections of the SEMP become valuable – the universal guidelines that address issues that occur throughout the study area, and the specific management guidelines for each management zone.

Decisions that require more insight and strategic judgements make up the second tier. These require a 'feeling' for the balancing of issues and values due to the presence of conflicting recommendations from evaluations on the first tier. An example would be a subdivision application that complies with tourism development criteria, but conflicts with the standards for minimum subdivision sizes. In these cases, the decision-maker needs to have decision-making principles to fall back on, in order to inform the trade-off between benefits and disadvantages of different decisions. The principles applicable to strategic decision-making in Metsweding are contained in the 'Environmental objectives' section of the SEMP.

The two types of decisions must be accommodated under the umbrella of adaptive management, which views the implementation of management actions as continuously improving 'experiments' that emphasizes monitoring of the effectiveness of the actions, and thereby encourages learning, innovation and adaptability in a dynamic discipline, as opposed to as closed-ended and final.

The Strategic Environmental Management Plan for Metsweding consists of three management levels namely;

1. principles,
2. universal guidelines, and
3. management zones.

These are addressed in the next sections of this report.

7.3 Environmental principles

7.3.1 *No net loss of ecosystem function, and maintaining the resilience of critical and sensitive environments*

In order for critical (offering critical ecosystem services) and sensitive (designated through conservation biology principles, standards or strategies) environments to remain ecologically functional, they must remain above a minimum size and functional integration level, require an 'operational buffer' that will ensure their resilience during stressed periods, and must be protected from progressive degradation.

In order to ensure the continued healthy functioning of the sensitive or critical ecosystems, conservation practices and management measures must be applied to ensure continuous perseverance and resilient

existence of at least the minimum core units of the systems. By implication, no further degradation of core habitat units may occur. This implies the avoidance and mitigation of detrimental impacts on the cores, as well as relevant buffers and supportive ecosystems.

‘Core units’ of habitat are defined as natural vegetation patches of 5ha or larger. Smaller fragments can only function in a supportive role, if the necessary ecological corridors linking them to larger patches are present. They will therefore not be considered as part of the current ‘stock’ of natural habitat.

7.3.1.1 Levels of acceptable change

1. Since it is impossible to recover grassland habitats to a natural state once they have been severely disturbed, a ‘No net loss’ approach must be followed for the critically sensitive grassland veld types, namely Marikana Thornveld, Springbokvlakte Thornveld and Rand Highveld Grassland. *This will be implemented by protecting all intact core vegetation units of 5 hectares or larger in these habitats.* ‘No net loss’ implies that no new disturbance of pristine habitat may occur, and that degraded sections of core areas may be developed only if an equivalent offset is provided that will improve the state of conservation of the vegetation type³.

2. Wherever an intact unit of critically sensitive grassland vegetation larger than 5ha is found, irrespective of whether it falls across more than one property, the following considerations will apply:

Firstly, no new disturbance of pristine natural habitat may take place (in accordance with the no net loss principle). Development can only be considered for already degraded areas within the core areas.

Secondly, development proposals have to show how the development proposal attempted to avoid, minimize, rectify and reduce environmental impacts.

Thirdly, and as last resort, biodiversity offsets in the form of the formal protection (assigning a statutory protection such as a conservation servitude or protected area status) of similar sized units in *more* functional locations (i.e. next to watercourses or other remaining natural areas) will be required for any development that will transform degraded portions of vegetation units of the identified three critical veld types.

3. The same no net loss approach will apply to wetlands. However, it is possible to restore wetlands to a functional level if the level of disturbance has not been too severe. Therefore, the restoration of wetlands may be accepted as a form of offset. Since water security is critical to the sustainability of development, all wetland protection and restoration offsets must occur within the boundaries of the Metsweding Area. Offsets must result in a net gain in wetland ecosystem services.

4. The freshwater ecosystems (rivers and wetlands) in Dinokeng must remain at acceptable River Health Programme EcoStatus standards (i.e. relative to the ascribed ecological importance), whilst at the same time offering natural migration corridors for both flora and fauna. Watercourses and water bodies therefore require management measures in their catchments, as well as management of impacts within their real spatial extent and immediate buffer areas. *Water quality therefore may not fall below standard*, and migration corridors have to remain in a state that will allow for through-movement of small to medium sized mammals. This implies that the corridor has to remain wide enough, and with enough natural vegetation for protective cover and foraging, and as part of a larger unfragmented network.

³ The two fundamental principles underlying the concept of biodiversity offsets are: 1) it is impossible to replace pristine vegetation, and 2) offsets should be less enticing than preserving habitat as is. The first implies that offsets cannot be used to ‘replace’ pristine grassland, and the second prevents offsets from becoming a perverse incentive to intentionally degrade pristine habitats.

5. Ridges represent valuable ecological and aesthetic resources. Encroachment onto them therefore permanently degrades the resources and reduces their value. Application of the GDARD Ridges policy is not sufficient context, due to the difference between the urbanised and rural zones in the area (particularly considering the importance of the Bronberg Ridge). The GDARD policy should be applied on a regional level only, and for purposes of identifying the most substantial ridge systems. Smaller ridge systems must be individually determined on a case-by-case basis, and their values in terms of ecological function and social value quantified, in order to inform development decisions. Ecological integrity may not be compromised, whilst the value of a diverse and scenic topography must be shared between affected parties.

7.3.1.2 *Spatial reference*

The location of watercourses, wetlands and vegetation units of importance can be found on the Status Quo mapping. However, mapping exercises are never perfect and are often done at a scale too coarse for individual assessments, especially since the landscape can be very dynamic in ecological and developmental terms. The maps should therefore be used for guidance, but on-site investigations used to determine the actual extents and state of transformation. Aerial photography (e.g. Google Earth time series) can be used as additional reference and verification tools.

7.3.2 *Integrated services planning*

7.3.2.1 *Objective*

Infrastructure must be provided in a manner that eliminates services backlogs and facilitates economic development in a cost-effective and best practice manner, without harming the functioning of the natural environmental system. The only way in which this can be achieved is through integrated planning of both the design and operation of the various municipal infrastructure services. Integrated planning can avoid duplication of impact, effort and cost, simplify network integration, avoid multiple failure points in networks, and maximise the synergies between different systems.

Integrated infrastructure planning must therefore first align individual infrastructure projects with the main planning objectives (services backlogs, etc.) and with each other, second with the needs of, and opportunities presented by, the natural environment, and third with cross-cutting strategic socio-economic issues such as poverty, disaster management, and so on.

7.3.2.2 *Levels of acceptable change*

1. All municipal services must be provided at or above the minimum prescribed service level. Bulk infrastructure installations must be designed from a municipal perspective, and not for exclusive use or benefit of a particular development or area.
2. Infrastructure planning may not disrupt the natural functioning of critical or sensitive ecosystems and the Gauteng Cplan 3 should be used for spatial guidance.
3. The design of infrastructure projects must take into account:
 - Cumulative impacts
 - Environmental impacts
 - Integration with adjoining areas
 - Compatibility with municipal targets and spatial objectives
 - Balance between demand-side management and infrastructure supply
 - Long-term maintenance and upgrade/replacement requirements
 - Shared servitudes

7.3.2.3 *Spatial reference*

Services backlogs detailed in the Status Quo Report, socio economic chapter and the immediate priorities are also highlighted in the local integrated development plans. These backlogs must be considered in conjunction with the expected urban expansion areas and environmental sensitivities (i.e. the EMF management zones), in

order to identify the best locations and optimal sizes for major installations such as bulk transmission/transportation lines, reservoirs or treatment works.

7.3.3 *Environmental sustainability in design*

7.3.3.1 *Objective*

The principle to be applied here is that development must use best practice environmental designs in order to relieve pressure on people's resources, infrastructure networks and the environment in general, whilst promoting social resilience through job creation, social investment, poverty eradication and the like. It must be realised that the sustainability of many industries depend on a steady supply of water, resources and human capital, as well as communication and transportation networks. If the natural environment is compromised, so will the supply of resources and the communication and distribution networks.

Ecosystems deliver environmental management and social services to society, often in unrecognised forms. These can range from natural stormwater attenuation to the provision of natural resources for fuel or food, but also extend to issues such as human psychological health (for example, as related to livelihoods and recreational space) or pollination. Water quality services are of critical importance in current times, as an increasing population places higher pressure on the supply of potable water, water treatment works and health care. A naturally functioning wetland ecosystem has the ability to filter and treat surface water, with little or no external intervention. This has obvious benefits in terms of health risks and demands for water treatment facilities. In addition, the vegetation and absorption capacity of wetlands reduce the speed and volumes of surface runoff, thereby also increasing the amount of groundwater recharge and flattening the flood peaks after rainfall events.

A higher social resilience will naturally translate into more sustainable patterns and forms of resource utilisation. As an example, communities who are not reliant on a single source of energy will be better able to withstand interruptions in supply, whilst the same diffuse supply-demand system will increase the general operational efficiency of municipal infrastructure. Similarly, a diverse mix of resource supply and income generation (such as using a domestic vegetable garden to supplement income) will ensure better financial and food security. Appropriate waste management at source in the form of waste reduction, recycling, composting, etc. will reduce the dependency on municipal waste collection systems, thereby increasing the resilience of both the waste producer and the municipality as a whole.

7.3.3.2 *Levels of acceptable change*

1. Energy

Efficiency: Metsweding should pursue the national target for renewable energy supply of 15% by 2020, along with a concerted strategy of demand management. Demand-side management must be applied in all developments, with the requirement that high-income developments reduce their energy demand on the supply network, whilst low-income development reduces the total cost of energy for consumers.

Distributed generation and renewable sources: Development must show that renewable energy supplies were considered as micro-generation options. These include diversifying the supplier mix, off-grid generation for small applications or co-generation such as the capture and use of by-products such as waste materials or heat.

The design of any infrastructure must demonstrate that there are no ecosystem services that can be co-opted or used instead of hard structure solutions.

All built structures must employ low carbon alternatives such as construction materials and methods with low levels of embedded carbon.

2. Waste

All developments must make provision for recycling points – at least a central collection and sorting point, and preferably differentiated receptacles throughout the development. Municipal waste removal services must have a component that deals directly with recovery and recycling, or alternatively with schemes for private recycling companies to manage recycling on their behalf.

3. Water

Surface water management in the municipality must maintain the natural functioning of watercourses. An important means to achieve this is through better management of the water supply infrastructure. This includes appropriate stormwater management systems that incorporate catchment-level design, retention structures, groundwater recharge and preservation of ecological corridors for both aquatic and terrestrial species.

Erosion problems must be addressed without delay, and the design of large infrastructure must make provision for projected development trends. Development and construction must be located and designed with full acknowledgement and accommodation of natural drainage lines and contours, in order to limit the risk of concentrating surface runoff more than what can be naturally compensated for.

4. Climate change

At a local level a municipality must be climate change aware, by recognising that climate change will result in:

- Changes to climatic patterns (higher temperatures as well as increased variability and intensity of rainfall events)
- Demands for mitigation of activities that drive climate change (climate change response strategies on local, provincial and national levels)
- The need to adapt to inevitable climate change impacts (risks to infrastructure, disaster management, food and water security, changes to commodity and resource costs)

Management and development activities will therefore comply with national and provincial standards for climate change mitigation and adaptation. The objective would be to maintain social-ecological resilience in natural and social systems. The natural ecosystem functioning must therefore be accommodated within development without compromising the ability of the system to adjust to climate change or shocks. Similarly, social development may not take place in a location or format that will compromise the resilience of the community in terms of risks from natural hazards or benefits from renewable natural resources or ecosystem services.

7.3.3.3 *Spatial reference*

The natural systems required for sustained ecosystem functioning and services are defined by the Biodiversity zone (CPlan 3), but the objectives and limits to acceptable change will apply throughout.

7.4 Universal guidelines and policies

7.4.1 *Mining*

Mining activities occur with several other land use activities including the conservancies, and with other development activities. Mining and nature-based activities are generally incompatible, and conflicts are present, with each sector arguing for its continued right to exist. Where mining activities are present, or planned, management intervention or control will be required to facilitate the co-existence of the various land uses.

Mines may consist of subsurface or surface mining activities, but always involve some form of excavation and the discard of waste material. The waste can be in the form of tailings (fine processed material), waste rock

(unprocessed rock with no ore content) or overburden (soils and vegetative matter removed from the active mining areas).

The management requirements for the different activities and waste types therefore differ as well, as detailed in Table 12 for legal mining activities.

TABLE 12: MANAGEMENT REQUIREMENTS FOR MINING ACTIVITIES

		<i>Excavations</i>	<i>Tailings, waste rock, overburden</i>	<i>Water discharge</i>	<i>Weeds & invaders</i>	<i>Sedimentation & erosion</i>
Active		Water use Heavy machinery and vehicles Dust Noise Electricity Ongoing rehabilitation of mined-out areas End-use planning	Runoff Temporary or permanent vegetation Dust Leaching Overburden must be stored for re-use during rehabilitation	Water quality standards Water use licence Groundwater contamination or over-utilisation	Environmental Management Plan & rehabilitation actions	Environmental Management Plan
<i>Not active</i>	Rehabilitated	Monitoring	Permanent vegetation	Groundwater monitoring and pollution containment or treatment programme		Early detection and corrective measures
	Not rehabilitated	Rehabilitation programme & end-use planning	Rehabilitation programme	Groundwater monitoring and pollution containment or treatment programme	Annual follow-up treatment	Sediment traps and erosion control

Management of mining activities therefore needs to take into account the impacts of the mining during and after the mine’s operational activities. The legislated tool designed to facilitate this is comprehensive environmental management plans known as Environmental Management Programme Reports (EMPR). However, in practice, EMPRs tend to neglect the full extent of the mining impacts. EMPRs can be improved by community and authority participation in the compilation of the EMPRs, especially with regards to the consideration of spatial frameworks and environmental sensitivities, as well as the compilation of appropriate rehabilitation plans that identify viable end-uses for mines that would be compatible with the surrounding land uses.

However, an EMPR is only as good as its implementation. Stakeholder involvement will be critical since, for example, nearby conservancies will be able to monitor and report on mining activities on a more detailed level than any regulatory authority. Proof of compliance with the EMPR, as well as the effectiveness of the EMPR, must be documented and adjusted as required through a detailed monitoring and review process.

In order to address potential conflicts between land uses, an EMPR review coordination forum should be established or created within an existing structure. Further protected area proclamation also needs to be considered as a specific means of controlling the expansion of mining activities in sensitive zones. The current level of information about mining activities in the Metsweding area (following the EMF mining audit contained in the status quo report), is sufficient basis for meaningful engagement between the various parties. Further consultation and information collection should not be used as excuses to delay concrete actions against illegal or defaulting mining operations, or the compilation of an overall plan for mining activities.

TABLE 13: STAKEHOLDERS AND RESPONSIBILITIES RELATIVE TO MINING ACTIVITIES

Stakeholder	Responsibility
<i>DME</i>	Mining permits Environmental considerations Permit compliance monitoring and enforcement
<i>The Dinokeng Project (applicable the Dinokeng area only)</i>	Negotiations Oversight
<i>Conservancies</i>	Local policing
<i>Mine operators</i>	Compliance with best mining practice, EMPRs, and water use licence conditions
<i>GDARD</i>	EIA and EMPR evaluations EIA compliance monitoring and enforcement
<i>DWA</i>	Water use policing Ecological Reserve

The following guidelines should be applied in Metsweding when considering new mining applications:

- New mining or extension of mining activities may not fragment or interrupt designated sensitive (biophysical) areas or corridors that form the basis of a particular ecological resource. The Gauteng Bioregional plan currently being finalised must be taken into consideration for any new mining application.
- Mining activities may not infringe on the ecological reserve of local water resources
- There should be appropriate ecological buffers between mining activities and sensitive environments such as wetlands and watercourses, or pristine grassland areas larger than 5 hectares, to ensure that mining does not pose a risk to these ecological resources.
- No new mining or extension of mining activities is allowed in the Dinokeng Game Reserve unless it can be proven with certainty that the activities will not materially affect the establishment and operation of the nature reserve or negatively affect biodiversity
- Mining activities may not detract from tourism and recreational activities in designated tourism or recreational hubs, nodes or corridors. Cullinan town is recognised as an exception as much of the towns tourism is linked to historical diamond mining activities
- New mining or extension of mining activities must provide for a rehabilitation and mine closure program to ensure that suitable post-mining activities can take place on the land (e.g. development or indigenous revegetation), with no active erosion, no remnant or ongoing pollution of the surface or groundwater and at least 75% ground cover. That is, mined areas may not be left as sterile land.
- Mining refers to all of the associated activities with mining, including the transportation of materials and the processing of raw materials, and must be considered as part and parcel of the overall mining impact and operations. Consequently, these activities must be planned for, designed and located in a manner that does not detrimentally affect other activities in the area that depend on environmental quality or a rural sense of place.

Detailed guidelines for the planning, construction, operating and decommissioning of mines are provided in the Mining in Metsweding Best Practice Guideline (GDACE, 2007b).

7.4.2 Development planning & densification

Development planning in Metsweding must be based on the premise that broad distinctions can be made between different land use pattern categories, namely tourism and recreation facilities, single residential use on individual farm portions, housing estates (including through clustered subdivision), nature reserves,

conservancies and urban development. Exact differentiation is impossible due to the overlap between categories, and wide variation that is possible within each category. However, development proposals can be 'judged' by authorities with the necessary mandate in order to ensure proper application of the framework. All land uses must be granted an equal right to existence, but discernment on the part of the authorities is required to safeguard appropriate uses in certain areas. For example, rural lifestyles in defined rural areas must be actively protected by the relevant authorities, whereas commercial uses can be encouraged in other areas.

The following indicative definitions are proposed:

Tourism and recreation – facilities and infrastructure that provide accommodation, function facilities, recreational activities and similar to visitors, with ancillary residential buildings for the operators of the facilities.

Agricultural use – a single residential farmhouse and ancillary buildings used for workers' accommodation, equipment storage, produce storage, animal shelter and small-scale agri-industrial uses. Agricultural production is presumed but, especially on smaller properties, not necessarily present. This land use category also includes game farms, whether or not they are managed as 'private nature reserves'.

Housing estate – Large, access-controlled cluster of single residential private stands, used for residential purposes, but typically with 'themed' ancillary uses such as golf courses, 'conservation areas' or recreational facilities (boutique hotel, clubhouse, etc.).

Nature Reserve – land formally protected under NEM:PAA.

Conservancy – voluntary association of land users and owners registered with a conservation authority who cooperatively manage their natural resources with the aim of preserving the sustainability of the resources through responsible environmental management.

Urban – mixed-use activities on small stands commonly associated with social service centre contexts, and serviced through a system of municipal reticulation or distribution networks, on land designated as urban through the application of an urban edge by the authorities.

7.4.3 Sensitive environments

Sensitive environmental elements, namely pristine grasslands, topographic diversity, watercourses, wetlands, migration corridors and biodiversity enclaves, will always remain the lifeblood of a region. They represent the main anchors for tourism development in the rural areas, a municipal safety net for the urbanised zones, and generally speaking, an important component of social well-being. It is therefore necessary to identify, preserve and conserve both natural core areas as well as buffer areas required to maintain these core areas as functional units during periods of stress or as a result of development encroachment. The buffers will reduce the total direct impact of development activities on sensitive environments, and represent migration corridors through the landscape that will increase the resilience of islands of biodiversity.

Ongoing urbanisation will require intact ecological systems for their role in providing ecosystem services. These services include stormwater management, water purification, groundwater recharge, pest control, micro-climatic control, pollination, etc.

TABLE 14: CLASSIFICATION OF ECOSYSTEM SERVICES (SHACKLETON ET.AL., 2008)

Type of ecosystem service	Service rendered
Provisioning services (material benefits or products from ecosystems)	Natural products
	Building materials for shelter
	Fuel wood
	Crops
	Fodder

<i>Type of ecosystem service</i>	<i>Service rendered</i>
	Fresh water
	Honey
	Materials to craft household utensils
	Materials used in cultural practices & rituals
	Natural product derivatives (e.g. oils, dyes, waxes, resins)
	Raw materials for agricultural implements
	Wild animal foods
	Wild plant foods
<i>Regulating services (benefits obtained from regulation of ecosystem processes or buffering capacity)</i>	Air quality regulations
	Climate regulations
	Climate moderation & buffering against extremes
	Detoxification & decomposition of wastes
	Disease regulation
	Disturbance regulation
	Drought mitigation
	Erosion control
	Maintenance of biodiversity
	Maintenance of soil fertility
	Pest regulation
	Pollination
	Protection from natural hazards
	Refugia
Water quality	
Water regulation/flood control	
<i>Cultural services / enriching services (non-material benefits obtained from ecosystems)</i>	Aesthetic values
	Cultural heritage / symbolic values
	Cultural diversity
	Educational values
	Inspiration
	Knowledge systems
	Recreation & tourism
	Social relations & values
	Spiritual uses
<i>Supporting (processes necessary for the production of other services)</i>	Biodiversity
	Photosynthesis/primary production
	Nutrient formation
	Soil formation
	Water cycling

It is therefore necessary to identify and maintain sensitive environments as a functional ecological system. This implies the conservation and protection of inherently sensitive habitats such as ridges, wetlands and river systems, but also large unfragmented and untransformed grasslands, migration corridors between sensitive areas, and locations where rare or endangered species are known to be present. Where necessary, these areas will need buffers around them that can protect them from the negative influences of adjacent land uses.

Additionally, mitigation measured may be employed that further reduce the impacts of development on sensitive environments. For example, development densities may be reduced through retaining or planting vegetation in-between structures and along linear infrastructure to serve as a 'softening' agent and emergency habitat to increase the resilience of the natural fauna & flora. Care must, be exercised to prevent weeds and invasive species from replacing critical primary vegetation. 'Re'vegetation with indigenous plants that offer food or shelter to sensitive species is recommended. Clustering of development features is always a good practice, as it serves to increase the total size of remaining unfragmented vegetation units.

TABLE 15: STAKEHOLDERS AND RESPONSIBILITIES IN SENSITIVE ENVIRONMENTS

<i>Stakeholder</i>	<i>Responsibility</i>
<i>GDARD</i>	Technical guidance EIA evaluations
<i>Local Authorities</i>	Development applications Spatial planning
<i>DWA</i>	Technical guidance Water use licences
<i>DME</i>	EIA evaluations Best practice
<i>Utilities</i>	Route alignments Construction and operational best practice

7.4.3.1 Specific sensitivities

Particular sensitivities that require acknowledgement, management, development controls and buffer zones, and that do not necessarily conform to the characterisation of the management zone where they are located, will occur in scattered locations. For example, in all the zones, locations of specific sensitive or endangered fauna & flora or habitats would require appropriate buffer areas.

Biophysical features include Red Data Flora, Bullfrogs, *Ichneostoma stobbiai*, Pythons and Karst systems (caves). More intensive surveys are required order to establish the breeding localities as well as estimates of the current conservation status of sensitive species such as amphibians and reptiles.

Heritage artefacts will also be scattered throughout the region. Heritage features must be recorded and dealt with as required by the NHRA and SAHRA (refer to the status quo report for details).

7.4.3.2 Systematic biodiversity conservation

Systematic biodiversity assessments provide guidance on the relative importance of sensitive and critical biodiversity features, and guidelines on how to prioritise conservation initiatives. The GDARD C-Plan analysis represents this type of analysis for Gauteng. The conservation priorities identified by C-Plan need to be applied as the foundation of the environmental management system, in order to prevent detrimental encroachment and impacts from developments and land uses.

three classifications are used for natural open spaces– core areas, buffer zones and corridors – and the guidelines below set out the necessary conservation parameters for biodiversity conservation in Metsweding.

Core areas:

The core areas consist of the critically sensitive environments such as remaining large areas of pristine grassland (larger than 5ha, irrespective of property boundaries), rocky ridges and outcrops, watercourses and wetlands. Core areas are also an integral part of the CBAs within the draft bioregional plan for Tshwane.

Buffer zones:

The buffer areas are transitional zones on the outside of the core areas that are required to maintain the ecological functioning of the cores. Different buffer requirements apply to the various environmental states present as a result of the differentiated nature of development pressure and habitat diversity. For example, in uniform landscapes (e.g. open grassland) a minimum width of 200m (GDACE, 2001) is required, whereas 50m may be adequate on either side of diversified and thickly vegetated areas such as watercourses.

TABLE 16: BUFFER ZONE REQUIREMENTS FOR SENSITIVE NATURAL ENVIRONMENTS

<i>Landform</i>	<i>Description</i>	<i>Motivation</i>	<i>Buffer Size</i>
<i>Uniform landscape</i>	'Open' areas such as large patches of grassland	Limited shelter for fauna Edge impacts from domestic animals (100m), ants (100m), human activity (130m), transitional species (175m), roadside pollution (20m-250m) Limitation of vegetation invasion (200m) (GDACE, 2001)	Development may not encroach closer than 200m from the edge of the core conservation area
<i>Diverse habitat</i>	Naturally wooded areas Rocky ridges	Shelter available	Development may not encroach closer than 100m from the edge of the core conservation area
<i>Watercourse in undeveloped area</i>	Watercourses with intact riverine vegetation clumps	Shelter and foraging available along an important migration corridor	100m from the bank of the stream
<i>Watercourse in developed area</i>	Watercourse through urbanised area – structures adjacent to the watercourse	Limited biodiversity remaining Stormwater management function	50m from the bank of the stream, or the 1:100 year floodline with a 5year development projection, whichever is greater
<i>Wetlands</i>	As defined by the Wetland delineation process prescribed by DWA	High biodiversity and high value for ecosystem services	See Table 19

TABLE 17: BUFFER ZONE REQUIREMENTS FOR AVIFAUNA CONSERVATION

<i>Species</i>	<i>Habitat and buffer requirements</i>
<i>Blue Crane</i>	400ha of contiguous suitable foraging habitat around Blue Crane breeding sites (usually in a wetland)
<i>African Grass-Owl</i>	100ha of suitable foraging habitat with a minimum terrestrial buffer of 170m from the edge of a wetland/stream
<i>African Marsh-Harrier</i>	Wetlands larger than 100ha that are identified as suitable habitat for this species must be buffered by 200m of terrestrial habitat.
<i>White-backed Night-Heron</i>	A buffer zone of 50m must be provided from the edge of the riparian zone
<i>White-bellied Korhaan</i>	The extent and location of the open space network set aside to accommodate the breeding and foraging requirements of this species must be motivated. Contiguous habitat patches must be >100ha.
<i>African Finfoot</i>	A buffer zone of 50m must be provided from the edge of the riparian zone
<i>Lesser Flamingo</i>	A buffer zone of 32m must be provided from the edge of the wetland temporary zone if the wetland is present within the urban edge and of 50m if the wetland is present outside the urban edge.
<i>Greater Flamingo</i>	A buffer zone of 32m must be provided from the edge of the wetland temporary zone if the wetland is present within the urban edge and of 50m if the wetland is present outside the urban edge.
<i>Black Stork</i>	For wetland foraging sites, a buffer zone of 32m must be provided from the edge of the wetland temporary zone if the wetland is present within the urban edge and of 50m if the wetland is present outside the urban edge.
<i>Half-collared Kingfisher</i>	A buffer zone of 50m must be provided from the edge of the riparian zone

Biodiversity corridors:

Maintaining corridors that ensure habitat connectivity and matrix permeability (the ability for species to migrate through the network and/or (re)populate new parts thereof) will translate into a wide diversity of species and ecosystem structures. The diversity grants the overall ecological system the ability to absorb or adjust to disturbances such as climate change or increased cyclicity of water availability due to the increased width of the ecosystem 'safety net'. Ideally, corridors should be 7km wide and consist of natural vegetation in order to ensure long-term, large scale biological movement (Ferrar & Lötter, 2007). In reality, and in rapidly

urbanising areas, this is not possible. The provision of corridors must therefore focus on non-negotiable critical components, such as hotspots and critical links, with a minimum width of 200m in uniform landscapes (e.g. open grassland) or 50m either side of diversified and thickly vegetated areas (such as watercourses).

Obstructions to natural species migrations, especially in-stream barriers, must be removed or improved in a manner that restores migratory routes for sensitive species or species with high ecological value.

7.4.3.3 Management measures for wetlands and watercourses

The management of all watercourses should:

- Control development within the riparian zone;
- Improve solid waste facilities and educate people on the impacts of littering;
- Stabilize bank erosion;
- Identify and control sources of pollution;
- Identify and find means to conserve wetlands needing protection;
- Remove alien vegetation;
- Maintain ecological corridors for aquatic and non-aquatic species; and
- Facilitate public access.

These measures should ideally be applied in a holistic, integrated manner, through means of an integrated catchment management strategy. Such an approach recognises that both rural and urban components and development patterns contribute to the maintenance or degradation of riverine environments. It can therefore find sustainable catchment management solutions with natural and built systems considered as one integrated system.

A catchment management policy needs to promote a healthy ecological and morphological state of rivers and wetlands throughout the catchment area. This can be achieved by controlling the frequency, quality, and quantity of runoff that emanates from natural stormwater, imported water sources and pollutant sources. Tangible deliverables that can be achieved include social amenity and aesthetic quality, public health, flood protection, protection of ecology and morphology of rivers and wetlands, protection of human health and safety and reduced vulnerability to climate change as well as ground and surface water recharge.

The following floodplain policy provisions should form the basis of a catchment policy (adapted from City of Johannesburg, 2008):

- No reclamation of land or construction of permanent structures permitted within the riparian zone or within identified buffers.
- All areas below the 100 yr floodline (or 32m from centre of river, whichever is the greater) to be zoned “open space”, preferably along with appropriate buffers.
- Relaxation of development controls may only be considered in special circumstances:
 - if required to protect existing development or infrastructure
 - if there is a demonstrable net benefit to river health
 - if modifications to the riparian zone are required to address stormwater attenuation requirements and the interventions will lead to a demonstrable net benefit to river health

Additional conditions relating to developments within various floodline zones that should be imposed are listed in Table 18. **Error! Reference source not found.** As a rule of thumb, no structure should be allowed within 150m of any watercourse or dam, except for water management purposes.

Water management structures such as dams, weirs or canals must be designed with the requirement that ecological function and biodiversity corridors along the watercourses be maintained.

TABLE 18: DEVELOPMENT CONTROLS FOR RIPARIAN ZONES

<i>Riparian Zone</i>	<i>Development controls</i>
<i>Within the riparian buffer zone</i>	Only permeable fencing, attenuation ponds
<i>50 yr to 100 yr</i>	No structure causing a loss of flood storage, no fill, berms or dykes, no structure that is not designed to applicable engineering standards, no impermeable roads or parking areas, no facility that poses a risk to water quality, no agricultural activity which results in destabilisation of groundcover or poses risks to water quality
<i>20 yr to 50 yr</i>	No permanent structures except bridge supports, only temporary structures not interfering with the functioning of ecological corridors or floodplains, no parking or roads
<i>10 to 20 yr</i>	Only ground level modifications that do not reduce the permeability of the floodplain soils or interfere the functioning of ecological corridors
<i>Below 10 yr</i>	Only approved water abstraction facilities, approved landscaping, or approved control erosion structures

Wetlands are particularly important in terms of biodiversity conservation and water resource management. All wetlands therefore deserve protection from detrimental impacts through the application of suitable buffer areas. Suitable buffers are therefore determined according to the size of the wetland and its conservation importance.

TABLE 19: BUFFER ZONE REQUIREMENTS FOR WETLANDS (DEVELOPED FOR CAPE NATURE, FROM CSIR, J.NEL, PERS. COMM.)

<i>Ecological Value Ranking:</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
	<i>valuable habitat and in pristine condition</i>	<i>near pristine, good habitat</i>	<i>low level of degradation, function described as 'good'</i>	<i>low level of degradation, function described as 'fair'</i>	<i>disturbed but intact</i>	<i>degraded with limited functionality</i>	<i>severely degraded and barely functional</i>
<i>Size:</i>	<i>(distance is given in meters)</i>						
<i>>20ha</i>	200	150	75	50	50	32	32
<i>5 – 20ha</i>	150	100	75	50	50	32	32
<i><5ha</i>	100	75	50	50	50	32	32

7.4.4 Tourism & Heritage

Three types of benefits to local communities, and especially the lower income sectors, can be gained from an appropriate CBT approach, namely economic benefits, non-economic livelihood impacts and an enhancement of participation and partnership:

TABLE 20: POSSIBLE BENEFITS FROM PRO-POOR TOURISM (PRO-POOR TOURISM PARTNERSHIP, 2009)

<i>Increase economic benefits</i>	<i>Enhance non-financial livelihood impacts</i>	<i>Enhance participation and partnership</i>
<ul style="list-style-type: none"> • Boost local employment, wages • Boost local enterprise opportunities • Create collective income sources – fees, revenue shares 	<ul style="list-style-type: none"> • Capacity building, training • Mitigate environmental impacts • Address competing use of natural resources • Improve social, cultural impacts • Increase local access to infrastructure and services 	<ul style="list-style-type: none"> • Create more supportive policy/planning framework • Increase participation of the poor in decision-making • Build pro-poor partnerships with private sector • Increase flows of information, communication

A reasonable aim should therefore be to provide one tourism job per household, along with non-financial benefits. General developments should also be set up to provide jobs for at least 80% of the local community – in this respect a social and labour plan should be prepared and submitted. Alternatively, a business plan to assist with setting up and growing a local SMME should be submitted by the applicant and an annual report submitted to monitor and evaluate the success of the business

Any employment initiated at different levels and scales by the project should target local residents whenever possible. Integrated rollout of skills development programmes and recruitment is therefore necessary to ensure the success of local recruitment ventures.

7.4.5 Institutional structures & basic services

7.4.5.1 Basic Services Delivery

The development of the area should strive for the following development standards:

- All households have access to electricity;
- All households have access to clean potable water.
- Existing infrastructure is maintained and current infrastructure upgraded where needed.
- Storm water drainage systems and flood management is adequate, and is upgraded where necessary – also in rural areas. It is considered and implemented where densification takes place.

Attaining the standards will only be possible though if pre-emptive planning is done rather than reactive *ad hoc* installations and maintenance of services infrastructure. Planning of services would necessarily have to involve load forecasts, supply capacity, servitude planning and maintenance requirement projections. New developments can then be required to contribute to an integrated services network that takes into full account the sensitivities of, and opportunities offered by the natural environment.

Other considerations that would improve the delivery of basic services are:

- Rural areas should not be considered less eligible for services than urban areas. However, rural service delivery should be planned and delivered in a way that supports rural living rather than progressive urbanisation. For example, subsistence farmers should be supported in their particular economic sector through the provision of farming support as part of a suite of basic services.
- Alternative sources of energy must be explored
- Local labour and community involvement must be optimised to upgrade, maintain, and implement infrastructure
- Groundwater quality must be monitored as an early warning system and input into a water resource management plan
- Communities should be educated about responsible water and energy usage

Environmental quality from an environmental health perspective will be directly related to the quality of waste management and pollution control activities of the municipality. The following standards should be applied:

- All households must be incorporated into formal waste removal systems for the different types of waste generated, taking into account the context of communities
- Communities are informed and educated about waste management, recycling and the potential impacts on the environment and tourism
- All illegal litter dumps must be cleared, especially along the Moloto Road corridor
- Landfill sites need to be managed according to applicable standards and permit requirements
- Air quality should be monitored and managed in high priority areas

All affected regulatory authorities must apply the principles stated above in the execution of their regulatory duties. This includes EIA, water management, land use and mining decision-making. Monitoring bodies must execute their duties in respect of both ecological functioning and socio-economic development. Coupled to this would be information management that facilitates decision-making.

7.5 Management requirements for the different management zones

7.5.1 Dinokeng Game Reserve

7.5.1.1 General management strategy

The DGR will be a protected area, supported by public administration and funding, but operationalised through private investment and development. In this regard, a management plan and operational agreements will determine and control most of the activities in the reserve. The Dinokeng Project has commenced a process of drawing up a comprehensive environmental and tourism management plan specific to the DGR, and hence this EMF will focus on providing general parameters that can inform the EMP and other relevant decision-making processes and instruments. A strong policy of not allowing incompatible land uses such as mining must be applied.

Activities in the DGR could potentially also be controlled through the application of national nature reserve management regulations if the DGR is proclaimed as a nature reserve, and if the national regulations are promulgated in a final form⁴.

7.5.1.2 Roles and responsibilities

TABLE 21: STAKEHOLDERS AND RESPONSIBILITIES IN THE DGR

<i>Stakeholder</i>	<i>Responsibility</i>
<i>The Dinokeng Project</i>	Funding opportunities Management guidelines Strategic management Implementation of the DGR EMP Declaration of the DGR as a protected area
<i>Municipal town planning departments</i>	Adjudication of town planning applications Adjudication of subdivision proposals
<i>GDARD (Gauteng), DEDET (Limpopo), DEDET (Mpumalanga)</i>	Technical advice and support on conservation and environmental management matters State veterinarian services Compliance and enforcement EIA evaluation and authorisation process
<i>Landowners</i>	Land care Self-policing

⁴ Proposed regulations for the proper administration of nature reserves were published for comment by the Department of Environmental Affairs in August 2009

<i>Stakeholder</i>	<i>Responsibility</i>
	Participation in forums Compliance with the DGR EMP
<i>Service providers</i>	Compliance with development guidelines Providing quality tourism products Compliance with the DGR EMP
<i>Visitors</i>	Responsible behaviour

7.5.1.3 *Compatible land uses*

- Protected areas & nature reserves
- Conservancies
- Limited tourism facilities including overnight accommodation with a development footprint limited to 1% of the site with a maximum footprint of 5 hectares. The proposed use should primarily be aimed at conservation activities that are not in conflict with other tourism or recreational activities or facilities in the vicinity, or with the rural sense of place and tourism focus of the general DGR area (e.g. noisy activities next to day spa). The development footprint means any evidence of physical alteration as a result of the undertaking of any activity
- *Bona fide* tourism land use
- Associated private residential use
- Existing island farms

7.5.1.4 *Incompatible land uses*

- Mining and prospecting
- Industrial activity
- Township establishment/urban development
- Housing estates
- Commercial activities that can function outside of conservation areas
- Land invasion and informal settlements
- Intensive agriculture (feedlots, chicken farms) and a progressive reduction in stock farming
- Subdivisions that are not motivated by bona fide DGR-related development

7.5.1.5 *Design standards, infrastructure requirements, regulatory requirements*

Development Policy Guidelines

Until such time as the development policy is revised or amended (i.e. the DGR EMP officially adopted), the 1% net hard surface development standard will remain in place, although such hard surface development areas may not exceed five hectares per development. It will be required of all development applicants to provide proof of the level of existing 'hard surface' development footprint before any additional development footprint can be considered by the relevant authorities. This will be verified electronically and via site visits by the relevant authorities.

It would be possible to move net available development footprint between title deeds, provided that any such development footprint transfer is notarially linked and proof to this effect is provided to the relevant authorities.

Subdivision

As a general approach, the subdivision of properties within the full extent of the envisaged DGR will not be allowed in order to simplify management coordination. Exceptions may be made for functional subdivisions required to facilitate tourism, recreational or other DGR-related development or alignment of infrastructure.

Facilities and structures

Infrastructure must be underground, or positioned in the landscape in such a manner that it does not detrimentally affect wildlife, watercourses, or visual quality. Installation must align with existing areas of disturbance, and include a comprehensive rehabilitation programme.

The design, construction, operation and decommissioning of facilities must comply with the general principles of this SEMP, the DGR Development Guidelines, as well as any other specifications laid down by regulatory bodies responsible for development coordination or environmental management in the DGR. Structures outside of urban areas may not exceed 2 storeys above natural ground level.

DGR EMP

The draft DGR EMP (October 2009) provides the following Land Use Management Guideline summary table:

TABLE 22: POLICY OBJECTIVES AND MANAGEMENT RECOMMENDATIONS: LAND USE AND HOUSING (DRAFT DGR EMP, 2009)⁵

<i>Land Use</i>	<i>DGR context</i>	<i>Impacts</i>	<i>Policy guidelines/recommendations</i>
<i>Formal Residential/ Tourism Development</i>	The distribution and extent of residential and tourism facilities within the DGR has been analysed in detail in section 1.2.4.1 of the report. This information indicated that the residential component accounts for 33.5% of the total development footprint in the DGR, and tourism facilities for 26.5%. It can also realistically be expected that the spatial distribution of tourism facilities will increase in the foreseeable future.	<ul style="list-style-type: none"> • Loss in biodiversity quantity and habitat fragmentation as result of development footprint • Visual impacts of development, e.g., different styles, densities, etc. • Changes in river flow regimes as result of hardening of catchment areas • Decline in surface water quality due to polluted run-off • Decline in ground water quality as result of household sewerage systems • Lower infiltration to supplement groundwater reserves • Withdrawal of groundwater reserves by boreholes • Increased waste volumes • Increasing possibility of 	<ul style="list-style-type: none"> • The following guidelines should apply to limit the visual impacts of residential structures and tourism facilities: <ul style="list-style-type: none"> ○ Develop a policy on building appearance and outdoor signage, including architectural design, choice of colours and materials, etc. ○ Over illumination should be prevented. Lighting should be limited to the maximum extent possible, and no unnecessary lighting should be allowed. Where possible, lighting should be switched off during periods of low or no usage, e.g. late evenings and early morning hours, as well as during periods of low/no occupancy. ○ Light trespass should be avoided. The direction of lighting should be limited to the area where absolutely needed and not allowed to spread onto the surrounding veld or neighbouring properties. ○ Lights should be pointed downwards to limit contribution to sky glow (which will be significant in the Dinokeng area due to high levels of suspended particles in the area). ○ Screening vegetation (indigenous trees and shrubs) should be planted and maintained by all land owners to reduce the visual impact of buildings, roads and other infrastructure, disturbed areas, excavations and other features that may reduce the visual appearance of the landscape, on their properties. • Land owners should ensure that sanitation systems on their properties are appropriate for the site specific geotechnical conditions, and are well maintained. • All households should be served by a proper functioning sanitation system, suitable to site specific conditions. • All larger developments in proximity to bulk sewer lines of Tshwane Metropolitan Municipality, should link with those lines. • Waste material should be properly disposed of according to legal

⁵ Numeric or other references in this table refer to the Comprehensive EMP for the DGR, and should be updated in accordance with the most recent version of the EMP that is available.

Land Use	DGR context	Impacts	Policy guidelines/recommendations
		various forms of pollution	<p>requirements and as specified in the waste management guidelines specified in section 2.2.2.2..1 (F)</p> <ul style="list-style-type: none"> • Every effort should be made by land owners to control/limit soil and wind erosion • Stormwater outfalls should be designed not to cause erosion. No surface storm water generated as a result of the development of the area should be directed directly into the riparian or wetland system. • All new fuel storage, if any, should be aboveground and properly bunded. In case of existing underground tanks, groundwater quality monitoring should be regularly conducted to detect possible leakages. In case of spills or leakages, the relevant authorities should be contacted. A spill response strategy should be in place, including the on-site availability of a spill response kit. All relevant legislation and SANS standards regarding the construction, operation, maintenance and decommissioning of tanks should be adhered to • Use of insecticides should be minimised and eliminated where possible, and alternatives (e.g. mosquito nets and window netting) should rather be utilised. • Strict water conservation measures should be adopted • Xeriscape gardening, i.e. the use of xeromorphic or climate appropriate plants (all indigenous) that are adapted to the local climate, should be practiced. Apart from habitat provision, these plants require less water, and are more likely to survive drought conditions. Use of high-maintenance lawns and annual plants should be minimised. • Should any artefacts or other forms of heritage resources be discovered during the operational phase, SAHRA should immediately be notified, and a professional archaeologist should be called in to investigate.
<i>Informal Housing</i>	The location of informal and semi-formal housing areas is limited to the areas immediately adjacent to the western boundary of the DGR, with specific reference to the Steve Bikoville settlement. As indicated in section 1.2.4.1 of the report, a number of housing provision and services upgrading initiatives are currently underway in this settlement which is likely to lessen the negative impacts on the DGR.	<ul style="list-style-type: none"> • Air pollution due to the lack of electricity • Loss in biodiversity quantity and habitat fragmentation as result of growth of settlements • Decline in ground water quality as result of pollution, mostly due to lack of service provision • Decline in surface water quality due to pollution • Impacts of littering and illegal waste disposal 	<ul style="list-style-type: none"> • Discourage illegal waste dumping, especially along the border of the DGR and enforce appropriate by-laws. • The DGRMA will support initiatives to upgrade the standards of housing and services provided in the Steve Bikoville settlement • The DGRMA will work closely with relevant authorities to prevent any growth of the existing informal settlement, or the establishment of new informal settlements • Encourage the community to adopt cleaner alternatives to coal and wood burning for heating and cooking, e.g. solar cookers for cooking, and installation of insulation to reduce the need for heating. • Residential areas within the primary zone of influence should act as a buffer between the protected area and the core residential areas further to the west. The community should be encouraged to plant indigenous species to enable the creation of habitat to some of the more mobile species.

Land Use	DGR context	Impacts	Policy guidelines/recommendations
			<p>However, care should be taken to prevent the residential areas from acting as sink habitat.</p> <ul style="list-style-type: none"> • The community should be encouraged to collect resources such as medicinal plants and honey only as part of approved programmes in the DGR. • The community should be discouraged from damaging the fence, and be made aware of the implications of damage to the fence.
<p><i>Industrial/Commercial</i></p>	<p>The occurrence of industrial/commercial types of development within the DGR is limited to a number of non-participating properties. These include a Brick making factory, a grain mill, a detonator factory, and a retail complex (Safari Mall). Although these components are mostly located on island properties, they will have a continued impact on the future operation of the DGR.</p>	<ul style="list-style-type: none"> • Loss in biodiversity quantity and habitat fragmentation as result of industrial and commercial development • Non-sustainable use of ground water resources • Decline in ground water quality as result of industrial pollution and effluent • Decline in surface water quality due to industrial/commercial effluent • Loss in biodiversity quality (ecosystem health) as result of soil contamination • Impacts and ambient air quality 	<ul style="list-style-type: none"> • No new commercial or industrial land uses will be allowed in the DGR. The DGRMA should liaise with the NTTLM and other decision making bodies such as the Gauteng Development Tribunal to be recognised as an Interested and Affected party for any such applications on adjacent properties or non-participating properties. • All existing commercial or industrial uses should be operated in terms of the specifications and conditions of approved land use rights. The DGRMA should liaise with the NTTLM to ensure enforcement thereof on surrounding properties and non-participating properties. • The DGRMA should liaise with GDARD to ensure that existing commercial/industrial uses are strictly managed in accordance with the conditions and EMP of the environmental authorisation. If applicable, an application for rectification for unlawful activities should be undertaken. • The following management measures should be implemented to minimise risks associated with the transportation, storage, handling, use and disposal of materials, chemicals and other potentially hazardous substances that may be used at industrial/commercial activities on island properties: <ul style="list-style-type: none"> ○ All hazardous substances should be transported, stored, handled, used and disposed of according to the legal provisions stipulated in the Occupational Health and Safety Act and other applicable legislation. ○ Storage areas that contain chemicals and hazardous substances must be bunded with an approved impermeable lining. The containment capacity must equal the capacity of the storage containers. ○ Material Safety Data Sheets should be kept on-site for each potentially hazardous substance transported, stored or handled on the site. ○ The landowner and workers dealing with materials and substances must be aware of their potential impacts and follow the appropriate safety measures. ○ Scheduled hazardous waste and its containers must be disposed of at DWA - or DEA- approved facilities. ○ If applicable, hazardous substances and materials are to be transported in sealed containers or bags. ○ Hazardous substance storage areas must be designated, demarcated, fenced and roofed if necessary. ○ Location of hazardous substance storage areas must take into account

Land Use	DGR context	Impacts	Policy guidelines/recommendations
			<p>prevailing winds, distance to water bodies, boreholes and residences in the surrounding area, and on-site topography.</p> <ul style="list-style-type: none"> ○ Storage areas should be secure and be safe from access by children and animals. ○ Hazardous substance storage facilities should be cleaned and maintained regularly and leaking containers should be disposed of without spillage. ○ Hazardous storage and refuelling areas must be underlain with an impermeable liner to protect groundwater quality. ○ Storage areas containing hazardous substances and materials must be clearly signed.
<p><i>Agriculture</i></p>	<p>Agricultural activities are mostly in the takes the form of extensive cattle farming. With the exception of a limited number of more intensively utilised areas for sheep farming, these activities are generally of a low density and impact. It can also be expected that the occurrence of cattle farming will decrease with the implementation of the DGR. The extent of cultivated areas on participating properties is limited</p>	<ul style="list-style-type: none"> • Non-sustainable agricultural practices on marginal land • Soil contamination and decline in surface water quality due to agricultural pollution (e.g. pesticides) • Reduced river flows and water quality • Non-sustainable use of ground water resources as result of agricultural activities • Loss in biodiversity quantity and habitat fragmentation as result of agricultural activities • Decline in ground water quality as result of agricultural pollution • Overgrazing and loss in vegetation cover resulting in an increase in soil erosion 	<ul style="list-style-type: none"> • No new clearing of vegetation for cultivation which has not been transformed before, should be allowed in the DGR. • No livestock concentrations will be allowed in the DGR. The DGRMA should liaise with GDARD to ensure that existing livestock concentration areas on non-participating properties have an operation specific Environmental Management Plan. • The DGRMA should liaise with GDARD for the latter to ensure that any livestock areas on surrounding farms or non-participating properties which fall within the ambit of listed activities under Government Notice R386 of 2006, should obtain the necessary environmental authorization and management plan. These listed activities include: <ul style="list-style-type: none"> ○ Activity 1(h): The concentration of animals for the purpose of commercial production in densities that exceed – <ul style="list-style-type: none"> (i) 20 square meters per head of cattle and more than 500 head of cattle per facility per year; (ii) eight square meters per sheep and more than 1000 sheep per facility per year; (iii) eight square meters per pig and more than 250 pigs per facility per year excluding piglets that are not yet weaned; (iv) 30 square meters per crocodile at any level of production, excluding crocodiles younger than 6 months; (v) three square meters per head of poultry per facility at any time, excluding chicks younger than 20 days; (vi) three square meter per rabbit at and more than 250 rabbits per facility at any time, or (vii) 100 square meters per ostrich and more than 50 ostriches per facility per year or 2500 square meters per breeding pair. ○ Activity 1 (i): aquaculture production, including mariculture and algae farms, with a product throughput of 10,000kg or more per year.

Land Use	DGR context	Impacts	Policy guidelines/recommendations
			<ul style="list-style-type: none"> ○ Activity 1 (j): agri-industrial purposes, outside areas with an existing land use zoning for industrial purposes, that cover an area of 1000 square meters or more.
<i>Mining</i>	See detailed mining information in section 2.2.2.3.3	See detailed recommendations in section 2.2.2.3.3	See detailed recommendations in section 2.2.2.3.3
<i>Planning and management of housing and land use</i>	There are a number of existing spatial and other planning frameworks applicable to the DGR, with some inconsistencies regarding planning guidelines and standards. The capacity of the relevant authority to manage land use rights is also limited	<ul style="list-style-type: none"> • Inconsistent guidelines for evaluation of applications for changes to land use rights • Land use practices and uses inconsistent with provisions of existing land use rights 	<ul style="list-style-type: none"> • Use the results of the current Environmental Management Framework (EMF) process and the DGR Management Plan to inform the Spatial Development Framework of the municipality, and to inform decisions regarding applications for changes to land use rights and environmental authorisations • Revise the SDF of the local and district municipalities to clearly reflect the long term vision and implementation of the DGR • Prepare a consolidated Land Use Management System for the NTTLM to ensure coordinated and consistent management of land use rights • Inform relevant decision making authorities such as the municipalities, GDARD, DME and others of the proposed future extension of the DGR boundaries to ensure that current decision making processes do not compromise the longer term vision and viability of the DGR

7.5.1.6 *Natural resource management*

According to the terms of reference, the DGR EMP will make provision for guidelines on environmental management and the introduction of threatened or protected species. Environmental management is interpreted in a very broad sense, and will include ecological management, water, game carrying capacity, fire regimes, emergency incidents, disease, natural resource harvesting etc.

Once completed, the EMP will provide enforceable guidelines for activities within the DGR.

7.5.1.7 *Actions required (what, where, whom, when)*

- Declaration of the DGR as a protected area under the NEM:PAA
- Formulation of the DGR EMP
- Implementation of the EMF and DGR EMP guidelines

7.5.1.8 *Institutional structures*

- Coordination forums
- Compliance monitoring
- Game management
- Protected Area management
- Land owners/ operators forum

7.5.2 *Dinokeng Rural and Rangelands Zone*

The Dinokeng Rural and Rangelands Zone matches to the “Dinokeng Rural North Zone” in the Dinokeng EMF, with minor refinements for agricultural priorities and biodiversity.

7.5.2.1 *General management strategy*

The extensive areas of privately owned grazing and game farms surrounding the core DGR properties, between the project boundary in the north and the Moloto Road/R568 corridor in the south east, must be managed in a manner that promotes the ecological integrity of the DGR and prevents degradation of the tourism development opportunities for the DGR. This area should be managed in a way that holds the land in trust for potential future incorporation into the DGR and which gives support to rural dwellers and lifestyles (including subsistence farmers or farm workers).

In theory, the extensive farmland should be virtually indistinguishable from the actual DGR, as both consist of natural vegetation, and are run on the basis of non-consumptive agricultural activities such as game or stock farming. Land uses in the extensive rural farming area will be similar to those found within the DGR, but may involve less stringent controls over the activity mix.

Consequently, land uses need to be carefully planned and managed in order to maintain the environmental resource value of the area. Although most land uses may be considered in this zone, all decisions must be informed by careful evaluation of land use compatibilities and the maintenance of tourism potential. Mining, for example will be considered incompatible and undesirable, until proven otherwise.

Key aspects to manage will be visual quality, noise impacts, traffic control, stock management, veld management (fire regimes, water extraction) and disease control.

7.5.2.2 Roles and responsibilities

TABLE 23: STAKEHOLDERS AND RESPONSIBILITIES IN THE DINOKENG RURAL NORTH

<i>Stakeholder</i>	<i>Responsibility</i>
<i>The Dinokeng Project</i>	Funding opportunities Management guidelines Strategic management Declaration of the rangeland area as a protected environment
<i>Municipal town planning departments</i>	Adjudication of town planning applications Adjudication of subdivision proposals
<i>GDARD (Gauteng), DEDET (Limpopo), DEDET (Mpumalanga)</i>	Technical advice and support on conservation and environmental management matters State veterinarian services Compliance and enforcement EIA evaluation and authorisation process
<i>Other government departments (e.g. Mining)</i>	Participation in forums Support to rural communities and farm dwellers
<i>Landowners</i>	Land care Self-policing Participation in forums
<i>Service providers</i>	Compliance with development guidelines Providing quality tourism products
<i>Visitors</i>	Responsible behaviour

7.5.2.3 Compatible land uses

- Private nature reserves
- Protected areas
- Conservancies
- Limited tourism facilities including overnight accommodation with a development footprint limited to 1% of the site with a maximum footprint of 5 hectares. The proposed use should primarily be aimed at conservation activities that are not in conflict with other tourism or recreational activities or facilities in the vicinity, or with the rural sense of place and tourism focus of the general DGR area (e.g. noisy activities next to day spa). The development footprint means any evidence of physical alteration as a result of the undertaking of any activity
- Conservation land use aimed at the protection of natural indigenous habitat and species
- Grazing and game farms
- Associated private residential use
- Legal mining without significant impact on the overall area and specifically tourism activities

7.5.2.4 Incompatible land uses

- Low density residential estates
- Industrial, retail and commercial facilities (other than small-scale community services)
- Urbanisation
- Commercial activities (such as conference venues) that can function outside of rural areas
- Land invasion and informal settlements
- Subdivisions that are not motivated by bona fide agricultural or DGR-related development
- Cultivation or any other land use that will transform large expanses of natural vegetation and result in direct or indirect malfunctioning of ecological systems in the DGR or compromise the tourism potential of the area.
- Illegal mining, or mining with significant impacts on the sense of place of the area or on ecological functioning

7.5.2.5 *Design standards, infrastructure requirements, regulatory requirements*

As indicated, all land uses must be evaluated in terms of compatibility with adjacent land uses and the overall area. Compatibility and appropriate mitigation measures will be determined on the basis of:

- **Visual quality:** The “Dinokeng experience” depends on creating a perception of being far away from urban areas. Both the visitor facilities and mobility routes in the northern areas (around the DGR) therefore need to be protected from land use changes that will compromise their visual character. Vistas of wide open bushveld with thinly scattered rural developments should be maintained at all costs. Intrusive land uses should be considered for established urban concentrations or alternatively out of view from tourist facilities and activity areas.
- **Nuisance impacts:** “Pollution” can be defined as any matter or element perceived as being out of place. This can include light, noise or litter. These nuisance impacts are highly subjective, depending on a person’s reference framework. However, in the context of the Dinokeng Game Reserve, the perceptions of visitors to the area need to be valued higher, as their satisfaction determines the success of the local tourism-driven economic development initiative. Demand-driven standards for nuisance pollution therefore need to be implemented in terms of lighting, noisy activities, roadside maintenance, and the management of properties along tourist routes.
- **Traffic:** Part of the Dinokeng experience will be the perception that visitors can drive along remote rural roads in a nature reserve dominated landscape. Excessive traffic generated by daily commuting, or heavy vehicles related to industries and mining will detrimentally affect this environmental quality standard. Land use development and management must therefore take into consideration whether or not the land use will be generating undesirable traffic and mitigation measures that can be implemented to reduce the impact. Alternative locations for land uses and alternative transportation routes must therefore form part of all development proposals where transportation will be part and parcel of the development activity.
- **Private residential use:** Residential units associated with rural and agricultural development will represent the dominant form of ‘development’ in the Dinokeng Rural and Rangeland area. Residential uses, however, need to be executed with sensitivity towards the Dinokeng vision due to the intention to include, over time, at least some of the buffer zone properties into the official DGR. The following development standards will therefore apply, namely:
 - No subdivision
 - Avoid visual intrusion
 - 2 storeys max
 - 1% development footprint (max 2ha) including associated farm infrastructure and farm labourer housing
- **Mining:** Mining already takes place on certain properties within the Dinokeng Rural and Rangeland zone. There will also be future expansions and new mining activities. All mining activities must comply with the requirements of both the MRDPA and NEMA, and specifically with the obligations prescribed by operational and rehabilitation plans.

7.5.2.6 *Natural resource management*

All development – both construction and general activities – must remain of a low impact nature where it affects areas of high natural resource value or identified sensitivity. For sensitive environments, the requirements of section 4.2.1 must be followed. In particular, fencing between properties should be reduced to a minimum as a measure to encourage the natural movement of fauna. However, the application of the principles and guidelines of the forthcoming DGR EMP should prove possible in these buffer areas.

As with the island farms within the DGR, extensive stock farming will be problematic in terms of disease control, as there are serious risks of vector and pathogen transfer between livestock and game. Buffer areas might be necessary to avoid the transfer of disease vectors, and the transportation of animals during risk periods must be managed in a way that minimises the risk of contact. However, strict control will be required in

terms of disease control. The bulk of the responsibility will unfortunately be on the part of the livestock farmer as the measure of control over the domesticated animals is so much greater.

7.5.2.7 *Actions required*

- Declaration of the rangeland area as a protected environment under the NEM:PAA
- Active encouragement of stewardship actions by conservancies
- Information access for individuals and communities
- Support to responsible and/or low impact agricultural practices (this includes subsistence farming)

7.5.2.8 *Institutional structures*

- Conservancy or residents' associations
- Fire protection association
- Coordination between authorities on mining matters

7.5.3 *Agriculture Zone*

The agriculture zone is defined by the Gauteng Agricultural high priority and high potential areas. Where possible the CBA areas from the Gauteng CPlan have been excluded, but there is still some areas of overlap between the Gauteng Agriculture Priorities and the Gauteng biodiversity priorities.

7.5.3.1 *General management strategy*

Intensive and extensive agricultural activities will be pursued in the Agriculture Zone of the Metsweding area. Land use and infrastructural development must therefore relate to, or be supportive of, agricultural activities. However, the Agriculture Zone contains significant areas of ecological sensitivity. The maintenance of ecologically sensitive areas in an untransformed state is not negotiable and has to form part of the overall land use strategy of the zone.

7.5.3.2 *Roles and responsibilities*

TABLE 24: STAKEHOLDERS AND RESPONSIBILITIES IN THE AGRICULTURAL ZONE

<i>Stakeholder</i>	<i>Responsibility</i>
<i>Landowners and farmers</i>	Agricultural production Land care Water conservation Conservation
<i>Municipal town planning departments</i>	Adjudication of town planning applications Adjudication of subdivision proposals
<i>GDARD</i>	Agricultural support Environmental management application processes Conservation planning
<i>The Dinokeng Project</i>	Land use coordination
<i>DWA</i>	Water oversight
<i>NDA</i>	Agricultural support Subdivision applications
<i>Other government departments (e.g. Mining)</i>	Participation in forums

7.5.3.3 *Compatible land uses*

- Dryland cultivation
- Irrigated cultivation
- Agricultural supplies and services, including agri-industrial facilities

- Private residential use associated with farming activities
- Farm worker villages
- Tourism and recreational facilities that are compatible with agricultural activities
- Natural open space/protected areas
- Farm stalls
- Conservancies

7.5.3.4 *Incompatible land uses*

- Residential estates
- Urbanisation
- Mining and prospecting
- Industrial activity
- Township establishment
- Subdivisions that are in conflict with the densification parameters
- Activities that permanently disturb untransformed natural vegetation

7.5.3.5 *Design standards, infrastructure requirements, regulatory requirements*

Irrigation:

- Zero-till and scheduling of irrigation
- Water rights management

Subdivision: The minimum subdivision size for portions in the cultivation zone is 5ha.

Pesticides and fertiliser: The use of fertiliser and pesticides must comply with relevant standards and guidelines from the DWA, NDA and GDARD. Application of agrochemicals has to avoid killing non-target species, bioaccumulation and eutrophication of water resources.

Extension of cultivated areas: The extension of cultivated lands has to avoid encroachment into priority conservation areas. The untransformed grassland habitats are sensitive environments that need to be conserved, and extension plans or applications must be evaluated accordingly.

7.5.3.6 *Natural resource management*

Conservation of untransformed areas must comply with the standards set under sections 7.3 and 7.4.3 of this guideline.

7.5.3.7 *Actions required*

- Agricultural needs analysis
- Biodiversity stewardship with an education and awareness programme
- Agricultural information sharing
- Monitoring and enforcement of natural resource management regulations and guidelines.

7.5.3.8 *Institutional structures*

Agricultural coordination or community forum with representation from the regulatory authorities

7.5.4 Development Corridors & Consolidation Areas

7.5.4.1 General management strategy

The consolidation areas are located around existing settlements and towns, and are intended to give focus and spatial structure to urbanisation patterns. Urbanisation and densification will, however, be driven and managed with best environmental practices as reference, in order to create resilience in the built environments. Strategies will include the optimisation of ecosystem services, pre-emptive planning of open spaces, preparation for climate change pressures, etc.

All non-rural land uses will be accepted in these consolidation areas, but the application of standard town planning principles have to prevent conflict between incompatible uses and the creation of 'satellite' industrial areas that will place undue pressure on infrastructure. Development 'ribbons' such as along the R515 and the eastern boundary with Tshwane must be planned and controlled to ensure that the scale of development and nature of activities do not outpace the capacity of the local infrastructure (such as farm roads). These areas of expansion also need to take care to avoid sensitive and special environmental features like the Bronberg area.

Several principles will underlie urbanisation:

- Pro-active planning for excellence in urbanisation, as opposed to stop-gap measures to contain and control urban degradation.
- Major nodal points will be Roodeplaat, Bronkhorstspuit and Refilwe/ Cullinan and the linkages into the City of Tshwane. Development in these nodes may only follow the prescriptions of development frameworks that take transportation, municipal services and regional administrative functioning into consideration. For example, the designation of Rayton as the highest order node in Nokeng (Nokeng Tsa Taemane SDF, 2008/2009) must be motivated against the higher accessibility and lower bulk services requirements of the Roodeplaat node.
- The considerable urban edge that has been proposed for the Tshwane suburban extensions is also contrary to accepted national planning principles such as compaction (on metropolitan level), promotion of infill development, the optimal use of resources etc. The urban edge should be limited to within the designated urban zone.
- Detailed local spatial development frameworks (or Urban Development Frameworks) are required for key problem areas or strategic development areas. Priority areas are (1) the area between Zithobeni, Bronkhorstspuit and Bronkhorstspuit Dam and (2) the Silver Lakes, Mooikloof, R21 area.
- The Leeuwfontein/ Mahube Valley urban node identified in the Nokeng Tsa Taemane SDF is not supported on both town planning and environmental management grounds:
 - The Edendalspruit traverses the nodal area, and will require a buffer area of 250m -1km on either side of the bank.
 - The eastern section of the Magaliesberg range extends southwards from the proposed node, and must be preserved as a viable grassland habitat core area.
 - The combination of the Edendalspruit and Magaliesberg range creates a viable and functioning north-south ecological corridor. Its importance is further reinforced by the northward link with more ridge environments and natural habitat areas along the Edendalspruit and in the general Leeuwfontein area that eventually connects the corridor to the Roodeplaat Dam.
 - The importance of the ecological conjunction is evidenced in the recorded presence of bullfrogs, Grass Owls and Blue Cranes.
 - Urban sprawl towards the north will translate into the eventual loss of the remaining habitats through encroachment and general degradation.
 - From a planning perspective, nodal development should be focussed further to the south within the underserviced urban areas of Mamelodi.
- A major new regional commercial and residential node (the so-called M&T Node) is planned along the R21 near Irene and the Rietvlei Dam. This development is however currently hampered due to sewerage issues so all infrastructure issues need to be resolved before any further development

occurs. The site is also near priority CPlan CBA areas and no encroachment on the CBA areas should be permitted.

- The new Kungwini Spatial Development Framework, 2010 (draft) has earmarked a considerable urban edge around the Silver Lakes/Mooikloof area. This allows for considerable further eastwards expansion of the urban footprint in the south-western part of the District. The recommendation is that expansion is limited into the designated Urban Zone as there are potential conflicts with agriculture and biodiversity priorities.
- Progression towards carbon neutral development through means of renewable energy systems, green design in built structures, and carbon offsets.
- All development must investigate measures designed to conserve water and other natural resources, minimise soil, air, noise and light pollution and achieve a zero-waste status.

Based on an analysis of the environmental resource attributes of the area as a more regional perspective, it is possible to provide support the suggestion that the provincial urban edge be moved outwards to include the development south of the Roodeplaat railway line. An exact demarcation of the urban edge must be completed through means of dialogue in appropriate provincial planning forums and through means of SDF planning that is informed by the EMF findings. From a strategic environmental perspective, however, the urban edge may be redrawn to include parts of Doornpoort, Derdepoort and Kameeldrift, as well as the “Gem Valley” developments on Leeuwfontein north of the railroad. This must nevertheless not be construed as support for the development of an urban core in Leeuwfontein.

Transportation corridors must be allowed to retain their service function to the overall tourism focus of the Dinokeng area as well as Cullinan. This implies that land uses along the roads and railways must be planned and designed in a way that does not reduce the transportation medium’s ability to create access to tourism facilities or mobility for tourists. Design frameworks must ensure that the land uses along the Moloto road and rail corridors are environmentally and socially acceptable.

7.5.4.2 Roles & Responsibilities

TABLE 25: STAKEHOLDERS AND RESPONSIBILITIES IN THE DEVELOPMENT CONSOLIDATION ZONE

<i>Stakeholder</i>	<i>Responsibility</i>
<i>Municipal town planning departments</i>	Adjudication of town planning applications Adjudication of subdivision proposals Compilation of detailed SDF plans
<i>GDARD</i>	EIA processes
<i>Other government departments (e.g. Mining)</i>	Participation in forums
<i>Developers and land owners</i>	Design principles application

7.5.4.3 Compatible land uses

- Urban residential
- Business, retail and light industrial (clean industry)
- Heritage and tourism facilities
- Social and community services
- Transportation facilities
- Open space/protected areas

7.5.4.4 Incompatible land uses

- Heavy industry
- ‘Subdivision estates’ (conglomerate of small semi-rural properties with no formal township status, but predominantly used for residential purposes)

7.5.4.5 *Design standards, infrastructure requirements, regulatory requirements*

Residential:

Residential areas must be planned in a manner that encourages a mixed housing typology in accordance with the national strategy for the development of 'sustainable human settlements' and as required by local spatial development guidelines. Energy, water and waste management must form part of all designs. Development may only proceed if the necessary services are available and form part of an overall municipal scheme.

A detailed planning and design framework is required for the Roodeplaat area which would ensure that aspects such as visual corridors, vistas, gateways etc. are protected

Subdivision:

Subdivision of agricultural land within urban areas smaller than five (5) hectares should preferably not be supported. Smaller land parcels are not conducive for the development of meaningful urban settlements. Larger land portions facilitate better layout and urban design, which lead to better urban environments. Should subdivisions smaller than 5 hectares be permitted in terms of existing subdivision policies (or in cases where these subdivisions have already been approved), township establishment may only be permitted on consolidated land parcels with a minimum size of 5 hectares.

Designation as 'urban' must be seen as a moratorium on the subdivision of agricultural land in order to prevent sprawling patchwork townhouse development typical of urban expansion areas to the east of Tshwane. Rural residential must be considered only where it will form a buffer/transitional zone and not where it will later be taken up as 1-2ha townships.

Industrial uses:

No heavy industries are allowed.

Industrial nodes or areas must be located where the associated transportation needs will have the minimum impact on adjacent land uses and the local roads network. The size of the industrial areas must be determined according to the ability of the municipal services to process industrial waste, supply water and electricity, and maintain road infrastructure. The establishment of industrial facilities may not lead to concentrated or polluted surface water runoff, and consequent degradation or erosion of natural watercourses. Atmospheric emissions and noise generation must be considered before approval of the facilities, comply with environmental standards, and not constitute a nuisance to neighbouring land uses.

Commercial and retail:

The architectural design of commercial and retail structures must be sensitive towards the scale of the surrounding structures, the sense of place of the surrounding area, and any specific heritage or open space resources. Orientation of the facilities must always face the development towards any heritage or open space resources, and appropriate permeable interfaces must be created between the two land uses.

At least half the footprint area of all parking facilities must be multiple storey or consist of water permeable surface area.

Nuisance impacts must be considered during the design and evaluation phases of the development. This includes noise, emissions, traffic, light pollution and interference with pedestrian flows. Noise emitting equipment must be installed below the top of adjacent screening structures such as walls and buildings, and external lighting may not spill into adjacent properties or shine directly into open space areas or roads.

Infrastructure:

The main concerns related to infrastructure provision are the concerns with regards to backlogs and failures, and the impact that infrastructure can have on the natural environment. For Dinokeng, infrastructure planning and maintenance need to ensure security of supply to tourism and recreational functions. These functions may occur outside the priority backlog areas, but are not necessarily less of a priority in terms of services delivery.

Important considerations that have to be taken into account when planning, constructing and maintaining infrastructure are:

- Servitude management
- Repeated disturbance for maintenance and upgrades
- Corridors for natural species migration
- Invasive species associated with servitudes
- Visual impacts
- The ecological and hydrological impact of gravity pipelines next to watercourses
- Pipe bridges vs. pipe jacking
- Roadkill
- Habitat fragmentation
- Physical barriers – fencing, kerbs
- Fishways
- Road state and maintenance of verges

Transportation:

Public transport must be prioritised for general public mobility and tourist movement. These systems might require differentiated planning due to the different needs of the two sectors, but in some cases could overlap in terms of the facilities used.

On a local level, provision must be made for pedestrian and cycle space, as well as lay-by areas and parking for public transport vehicles.

7.5.4.6 Natural resource management

It is important that urban functions, facilities and infrastructure be designed in consideration of open spaces and enclaves of biodiversity if the diversity and ecological resilience of the open space network are to be maintained. The design process needs to consider both the impact of infrastructure development on biodiversity, and the potential benefits or services that are derived from a functioning biodiverse ecosystem. In this regard, care should be taken when planning and formulating spatial development frameworks, integrated transportation plans, stormwater management infrastructure and fragmentary linear infrastructure.

In order to maintain and optimise services that may be gained from naturally functioning urban ecosystems, urban densification needs to avoid encroachment or impacts on natural features that will result in progressive degradation of the ecological systems. By implication, urban design must provide for adequate buffer areas, the protection of critical open space areas, the control of urban by-products entering the natural system, as well as design and management strategies for open spaces that accommodates urban impacts. Open spaces must be granted a status of urban land use equal to any other 'typical' urban function.

Natural open spaces will be considered separate from park areas with a social function. Although the two may intersect and overlap, the absolute size provision must be calculated separately. i.e. social space must be provided at a ratio of 2ha per 1000 people or better, in addition to the natural open spaces required for ecological functioning, even if the two overlap.

7.5.4.7 Actions required

- Universally accepted design standards and town planning scheme.

- Monitoring and enforcement of natural resource management regulations and guidelines.

7.5.4.8 Institutional structures

Communication and interaction between authorities in order to ensure consistent and coordinated decision-making is an critical success factor. Spatial development planning in the form of the Integrated Development Plans and Spatial Development Frameworks must pre-empt development pressure in the consolidation areas, by compiling the necessary maps and standards through an appropriate pro-active revision cycle. Strict application of the Town Planning Scheme and Spatial Development Framework is necessary.

7.5.5 Recreation Zone

7.5.5.1 General Management Strategy

Tourism activities will be concentrated around nodes of heritage resources or natural splendour. This clustering must be encouraged through the necessary planning and regulatory controls, as well as an active facilitation of tourism development.

Recreation will be primarily focussed around the major waterbodies – Roodeplaat and Bronkhorstspruit Dams. Both are already well known as regional recreational facilities and are experiencing development pressures. These areas need to be developed as public access recreational resources, and not privatised or institutional facilities. The challenge is therefore to arrest the incremental private development along the shores of the dams, in order to avoid the limited access situation that has established itself at the nearby Hartebeestpoort Dam. The more recreational facilities there are in the recreational zone, the stronger an image will be created, and the more visitors it will attract.

The establishment of a recreational zone is not sufficient on its own though. The facilities also need to be maintained in a way that encourages visitors to return. This applies equally to the natural, or other, resource it is anchored to, as well as the actual facilities. In particular, the management of the zone has to address the water quality issues in the dam.

7.5.5.2 Roles & responsibilities

TABLE 26: STAKEHOLDERS AND RESPONSIBILITIES IN THE ROODEPLAAT RECREATIONAL AREA

<i>Stakeholder</i>	<i>Responsibility</i>
<i>Tourism operators</i>	Coordination of tourist information and strategy Marketing
<i>Facility owners/managers</i>	Sustainable operation of facilities Maintenance Quality service
<i>Local Authorities</i>	Sustainable and compatible land use planning Water quality monitoring and management
<i>The Dinokeng Project</i>	Tourism oversight and facilitation
<i>Provincial tourism agency</i>	Marketing
<i>GDARD</i>	Sustainable and compatible land use decision-making

7.5.5.3 Compatible land uses

- Tourism and recreation facilities
- Tourism information facilities
- Supportive infrastructure such as boat storage
- Agricultural activities that do not detract from the visual character of a particular area
- Open space/protected areas
- Conservancies

- Urbanisation, if located within a designated consolidation zone

7.5.5.4 *Incompatible land uses*

- Industrial, retail or commercial facilities that detract from the sense of place
- New extensive rural residential estates or subdivision schemes
- Infrastructure that detract from the tourism resource value
- Polluting activities or facilities with nuisance impacts
- Mining and prospecting

7.5.5.5 *Design standards, infrastructure requirements, regulatory requirements*

Essentially, land use development and management should aim to retain the environmental integrity of the dam itself and to have a detailed planning and design framework for the area that protect aspects such as visual corridors, vistas and gateways.

Tourism development must be based on the recommendations set by the ITDF and local tourism coordination forums. Heritage features must be recorded and dealt with as required by the NHRA and SAHRA. Preferably, all heritage artefacts need to be recorded and incorporated in any development that takes place in the area. The design and layout of transportation nodes and junctions must provide central and visible positions for tourism information signage.

Both Roodeplaat and Bronkhorstspuit Dams experience water quality issues from time to time, due to the inflow of enriched runoff from the eastern parts of Tshwane and the sewerage treatment works. This leads to algal and hyacinth blooms which, in turn, lead to eutrophication and nuisance impacts. However, the solution is relatively simple – if routine monitoring and management measures within the catchment area of the dam are applied, the unacceptable quality of inflow into the dam will be stopped. No sudden interventions costing huge amounts of money are required, simply basic responsible water quality management upstream from the dam. The problem can therefore be redefined as the systematic failure of responsible governmental agencies to address the causes of the pollution.

Immediate actions that are required include:

- Absolute control over activities and developments encroaching onto watercourses upstream of the dam, especially the application of suitable buffer zones around water resources
- Enforcement of penalties for environmental or other transgressions that impact on water quality in the catchment
- Management measures to mitigate the issue of variable water quality at water treatment works
- Development controls and environmental management actions that will improve the net overall state of watercourses and wetlands in the catchment

Development of a rail station close to the Roodeplaat node will facilitate access to those particular recreation facilities.

7.5.5.6 *Natural resource management*

All development – both construction and general activities – must remain of a low impact nature where it affects areas of high natural resource value or identified sensitivity. For sensitive environments, the requirements of section 7.4.3 must be followed.

For both dams catchment management measures aimed at improving water quality, especially for the upstream areas, are required.

7.5.5.7 Actions required

- Catchment management co-ordination
- Maintenance of public access and facilities
- Further development of tourism and recreational facilities, activities and resources
- Moratorium on non-tourism development

7.5.5.8 Institutional structures

A water quality task team comprising of the local authorities and DWA needs to coordinate a plan on how to deal with the water quality issue.

7.5.6 Rural Zone

7.5.6.1 General Management Strategy

The Rural zone is represented by all the areas that fall outside another defined management zones south of the Moloto road. It includes conservancy areas, farmland, institutional land, mining properties, etc. These areas are not specifically designated as ecologically sensitive, but remain important in terms of preserving open space and the rural character of Metsweding, and maintaining general environmental services.

The Magaliesberg and its foothills are particular landscape features that will define the area for any visitor approaching from the South. These ridges represent important ecological resources and migration corridors for species.

Simply put, therefore, this area should focus on 'stewardship' which means to 'take care of' the environment, and may involve any relevant environmentally responsible actions and programmes that preserve, conserve or improve the natural resource base as the foundation for functioning ecosystem services. Consequently, land uses need to be carefully evaluated, planned and managed in order to maintain the environmental resources of the area. Although most land uses may be considered in this zone, all decisions must be informed by careful evaluation of land use compatibilities.

7.5.6.2 Roles & responsibilities

TABLE 27: STAKEHOLDERS AND RESPONSIBILITIES IN THE RURAL ZONE

<i>Stakeholder</i>	<i>Responsibility</i>
<i>Conservancies</i>	Conservation plan Land use development control
<i>Landowners</i>	Environmental sustainability and responsibility
<i>GDARD</i>	Technical advice Land use decision-making
<i>Local Authorities</i>	Land use planning and decision-making
<i>Other government departments (e.g. Mining)</i>	Participation in forums

7.5.6.3 Compatible land uses

- Conservancies
- Tourism and recreational facilities
- Grazing farms
- Private nature reserves
- Protected areas
- Associated private residential use, including workers' accommodation

- Estate developments or extensive subdivision schemes within serviceable distance from developed areas, and on condition that the environmental sensitivities are not compromised through direct, indirect or cumulative impacts.
- Legal mining without significant impact on the Metsweding area and specifically tourism activities

7.5.6.4 *Incompatible land uses*

- Industrial, retail and commercial facilities (other than small-scale community services)
- Mining, cultivation or any other land use that will transform large expanses of natural vegetation.
- Urbanisation
- Mining with significant impacts on ecosystem services

7.5.6.5 *Design standards, infrastructure requirements, regulatory requirements*

“Taking care of the environment” in the Rural Zone implies that a responsibility towards natural resources and the rural sense of place needs to be applied. Therefore, the following aspects need to be considered for any development in the Rural Zone:

- Heritage and historic preservation
- Natural resources
- Air quality
- Light pollution
- Visual impact (e.g. of signage)
- Water quality and conservation
- Energy efficiency
- Solid waste
- Project planning and site selection
- Support for traditional rural lifestyles

The management of the zone can be accommodated within community structures, whilst the infrastructure requirements should be identified and satisfied by the relevant authorities and service providers. Critical infrastructure requirements include the provision of water, electricity and telecommunications, whilst stormwater management should be accommodated through natural systems (excepting that hard engineering solutions are required at intersections with roads, etc.). Roads need to be maintained in a serviceable state, be they hard-top or gravel.

7.5.6.6 *Natural resource management*

All development – both construction and general activities – must remain of a low impact nature where it affects areas of high natural resource value or identified sensitivity. For sensitive environments, the requirements of section 7.4.3 must be followed.

7.5.6.7 *Actions required*

- Promulgate the draft bioregional plan for the City of Tshwane
- Active encouragement of stewardship actions by conservancies
- Information access for individuals and communities
- Ecologically and culturally sensitive tourism development
- Monitoring and enforcement of natural resource management regulations and guidelines.

7.5.6.8 *Institutional structures*

Institutional structures that are required are community forums or conservancy management bodies, fire management associations and a forum where mining matters can be amicably resolved and coordinated.

7.5.7 Biodiversity Zone

7.5.7.1 General Management Strategy

The Biodiversity Zone is represented by the Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) within the Gauteng CPlan 3. The only exceptions are where there are conflicts with high priority agricultural areas (where the agricultural hubs take preference) and where the areas are not already transformed.

It is important to note that:

1. The bioregional plan does not replace the need for site assessments, particularly for Environmental Impact Assessments and does not remove the need for on-site verification of the identified Critical Biodiversity Areas;
2. The underlying systematic biodiversity plan (C-Plan version 3, Compaan and Pfab 2010), on which the bioregional plan is based, is designed to be used at a scale of approximately 1:50 000.
3. Critical Biodiversity Areas within the bioregion are the portfolio of sites that are required to meet the regions biodiversity targets.

The Critical Biodiversity Areas need to remain in a largely natural state. The Ecological Support Areas should remain in at least (or be rehabilitated to) a functional state which are important for preventing degradation of Critical Biodiversity Areas and Protected Areas, and are particularly focussed on the maintenance of ecological processes (e.g. river buffers helping to moderate water flow during floods) and the delivery of ecosystem services (e.g. carbon sequestration).

The main objectives for this zone are to:

- Maintain natural land and ecological processes. Rehabilitate degraded areas to a natural or near natural state, and manage for no further degradation.
- Maintain ecological processes.

The guidelines in section 7.4.3 on sensitive environments should be applied here and any decisions taken within the Biodiversity zone should default the Bioregional plan for the City of Tshwane.

7.5.7.2 Roles & responsibilities

TABLE 28: STAKEHOLDERS AND RESPONSIBILITIES IN THE BIODIVERSITY ZONE

<i>Stakeholder</i>	<i>Responsibility</i>
<i>Conservancies</i>	Conservation plan Land use development control Maintaining biodiversity values
<i>Landowners</i>	Environmental sustainability and responsibility
<i>GDARD</i>	Technical advice Land use decision-making Implementation of the Bioregional Plan and CPlan areas EIA decision making
<i>Local Authorities</i>	Land use planning and decision-making Implementation of the Bioregional Plan and CPlan areas EIA decision making
<i>Other government departments (e.g. Mining)</i>	Participation in forums

7.5.7.3 Compatible land uses

- Conservancies

- Tourism and recreational facilities
- Private nature reserves
- Protected areas
- Extensive game farming and eco-tourism operations with strict control on environmental impacts and carrying capacities, where the overall there is a net biodiversity gain.
- Urban Open Space Systems

7.5.7.4 *Incompatible land uses*

- Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Industrial; Infrastructure (roads, power lines, pipelines).
- Mining, cultivation or any other land use that will transform large expanses of natural vegetation or impact on the provision of ecosystem services.
- Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures)
- Agriculture (forestry, dry land & irrigated cropping)
- Small holdings

Note: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to maintain overall ecological functioning.

7.5.7.5 *Design standards, infrastructure requirements, regulatory requirements*

The following actions should be implemented within the Biodiversity Zone:

- Maintain or obtain formal conservation protection for protected areas within Metsweding and specifically for the Dinokeng Game Reserve area
- Obtain formal conservation protection where possible for large areas
- Ensure protection of the Bronberg Ridge area
- No subdivisions should be allowed to avoid net loss of intact habitat or intensification of land use.
- Implement appropriate zoning and land management guidelines to avoid impacting ecological processes.
- In transformed areas which are important for maintaining ecological processes, current land uses should be maintained, intensification of use (e.g. a transition from agriculture to urban) should be avoided, and where possible areas should be rehabilitated.

Subdivision: As a general approach, the subdivision of properties within the full extent of the envisaged DGR will not be allowed in order to simplify management coordination. Exceptions may be made for functional subdivisions required to facilitate tourism, recreational or other development or alignment of infrastructure.

Facilities and structures: Infrastructure must be underground, or positioned in the landscape in such a manner that it does not detrimentally affect wildlife, watercourses, or visual quality. Installation must align with existing areas of disturbance, and include a comprehensive rehabilitation programme.

The design, construction, operation and decommissioning of facilities must comply with the general principles of this SEMP and the draft bioregional plan for the City of Tshwane.

7.5.7.6 *Natural resource management*

All intensive development and change of land uses must be avoided where it affects CBAs and areas of high natural resource value or identified sensitivity. For sensitive environments, the requirements of section 7.4.3 must be followed.

It is important that urban functions, facilities and infrastructure be designed in consideration of open spaces and enclaves of biodiversity if the diversity and ecological resilience of the open space network are to be

maintained. The design process needs to consider both the impact of infrastructure development on biodiversity, and the potential benefits or services that are derived from a functioning biodiverse ecosystem. In this regard, care should be taken when planning and formulating spatial development frameworks, integrated transportation plans, stormwater management infrastructure and fragmentary linear infrastructure.

Natural open spaces will be considered separate from park areas with a social function. Although the two may intersect and overlap, the absolute size provision must be calculated separately. i.e. social space must be provided at a ratio of 2ha per 1000 people or better, in addition to the natural open spaces required for ecological functioning, even if the two overlap.

7.5.7.7 *Actions required*

- Active encouragement of stewardship actions by conservancies
- Information access for individuals and communities
- Ecologically and culturally sensitive tourism development
- Monitoring and enforcement of natural resource management regulations and guidelines.

7.5.7.8 *Institutional structures*

Institutional structures that are required are community forums or conservancy management bodies, fire management associations and a forum where mining matters can be amicably resolved and coordinated.

7.6 SEMP Summary

The Strategic Environmental Management Plan for Metsweding consists of three management levels, namely principles, universal guidelines and the management zones. Day-to-day decision-making will rely firstly on the management guidelines for the individual management zones, with an overlap by the universal guidelines where applicable. Trade-offs, conflicts, 'judgement calls' and similar, will be decided through application of the SEMP principles.

The full description and guidelines for the principles and universal guidelines can be found under section 7.3 and section 7.4 respectively. Respectively, the SEMP principles, universal guidelines and Management Zones are:

Principles:

- No net loss of ecosystem function, and maintaining the resilience of critical and sensitive environments
- Integrated services planning
- Environmental sustainability in design

Universal Guidelines:

- Mining
- Densification
- Specific sensitivities
- Institutional structures

Management Zones:

- Dinokeng Game Reserve Zone
- Dinokeng Rural and Rangeland Zone
- Rural Zone
- Agriculture Zone
- Development Corridors & Urban Consolidation Areas

- Recreation Zone
- Biodiversity Zone

The Management Guidelines for individual Management Zones are summarised in below, and spatially referenced on **Map 1 - Environmental Management Zones**.

A Responsibilities Matrix is also provided.

TABLE 29: SUMMARY OF THE MANAGEMENT GUIDELINES FOR INDIVIDUAL MANAGEMENT ZONES

<i>Management Zone</i>	<i>General management</i>	<i>Compatible land uses</i>	<i>Incompatible land uses</i>	<i>Design standards</i>	<i>Natural resource management</i>	<i>Actions required</i>	<i>Institutional structures</i>
<i>DGR</i>	<ul style="list-style-type: none"> - Protected area - DGR EMP 	<ul style="list-style-type: none"> - Protected areas and nature reserves - Conservancies - Tourism & recreational facilities - <i>Bona fide</i> tourism land use - Conservation - Associated private residential use - Existing island farms 	<ul style="list-style-type: none"> - Mining and prospecting - Industrial activity - Urban development - Housing estates - Conference facilities - Land invasion and informal settlements - Intensive agriculture - Subdivisions not motivated by <i>bona fide</i> DGR-related development 	<ul style="list-style-type: none"> - No subdivision - Avoid visual intrusion - 2 storeys max - 1% development footprint (max 5 ha) 	DGR EMP	<ul style="list-style-type: none"> - Proclamation as Protected Area - DGR EMP 	<ul style="list-style-type: none"> - Coordination forums - Compliance monitoring - Game management - Protected Area management - Land owners/operators forum
<i>Dinokeng Rural and Rangelands</i>	<ul style="list-style-type: none"> - Development in support of the DGR - Protected environment status - Land management and development that does not preclude future incorporation into the DGR 	<ul style="list-style-type: none"> - Associated private residential use - Conservancies - Tourism & recreational facilities - Grazing farms - Private nature reserves - Protected areas - Legal mining without significant impact on the overall area and specifically tourism activities 	<ul style="list-style-type: none"> - Industrial, retail and commercial facilities (other than small-scale community services) - Land uses (cultivation etc.) that will transform large areas of natural vegetation. - Urbanisation - Residential estates - Conference facilities - Land invasion and informal settlements - Illegal mining, or mining with significant impacts on the sense of place of the area or on ecological functioning 	<ul style="list-style-type: none"> - No subdivision - Avoid visual intrusion - 2 storeys max - 1% development footprint (max 5ha) - Mining rehabilitation plans 	<ul style="list-style-type: none"> - No net loss of ecosystem function - Management guidelines for Sensitive Environments - Reduction in internal fencing 	<ul style="list-style-type: none"> - Active encouragement of stewardship actions - Information access for individuals and communities - Pursue Protected Area status 	<ul style="list-style-type: none"> - Conservancy or residents' associations - Fire protection association - Coordination between authorities on mining matters
<i>Agriculture</i>	<ul style="list-style-type: none"> - Agriculture - Agricultural support services/ functions 	<ul style="list-style-type: none"> - Dryland cultivation - Irrigated cultivation - Agricultural supplies and services - Associated private residential use - Farm worker villages - Tourism and recreational facilities - Natural open space/ protected 	<ul style="list-style-type: none"> - Residential estates - Urbanisation - Mining and prospecting - Industrial activity - Township establishment - Subdivisions that are not motivated by <i>bona fide</i> 	<ul style="list-style-type: none"> - Best practice agro-chemical use and irrigation - Minimum subdivision size of 5ha 	<ul style="list-style-type: none"> - No net loss of ecosystem function - Management guidelines for Sensitive Environments 	<ul style="list-style-type: none"> - Agricultural needs analysis - Biodiversity stewardship with an education and awareness programme 	Agricultural coordination or community forum

<i>Management Zone</i>	<i>General management</i>	<i>Compatible land uses</i>	<i>Incompatible land uses</i>	<i>Design standards</i>	<i>Natural resource management</i>	<i>Actions required</i>	<i>Institutional structures</i>
		<ul style="list-style-type: none"> areas - Farm stalls - Conservancies 	<ul style="list-style-type: none"> agricultural development or in conflict with the densification parameters - Activities that permanently disturb untransformed natural vegetation 			<ul style="list-style-type: none"> - Agricultural information sharing 	
<i>Development corridors and consolidation areas</i>	<ul style="list-style-type: none"> - Consolidation - No new nodes (e.g. Leeuwfontein proposal) - Infill between Rayton and Refilwe 	<ul style="list-style-type: none"> - Urban residential - Business, retail and light industrial - Heritage and tourism facilities - Social services - Transportation facilities - Open space/ protected areas 	<ul style="list-style-type: none"> - Heavy industry - Low density residential developments - 'Subdivision estates' 	<ul style="list-style-type: none"> - Mixed density residential - Sustainable designs - Local town planning standards - Township development bigger than 5ha - Layouts that make natural resources key features in developments - Sensitivity towards ecological features esp. in terms of infrastructure 	<ul style="list-style-type: none"> - Buffer areas - open space areas for ecosystem services - Pollution control - design and Management strategies for open spaces - Provision for natural open space in addition to public parks 	<ul style="list-style-type: none"> Stakeholder accepted town planning standards 	<ul style="list-style-type: none"> Coordination between authorities
<i>Recreation</i>	<ul style="list-style-type: none"> - Avoid privatisation of public resources - Maintain quality of recreational facilities and offerings - Sensitive development along mobility spines and at major junctions 	<ul style="list-style-type: none"> - Tourism & recreation facilities - Tourism information facilities - Supportive infrastructure - Agricultural activities that do not detract from the visual character of a particular area - Open space/ protected areas - Conservancies - Urbanisation, if located with a designated consolidation zone 	<ul style="list-style-type: none"> - Industrial, retail or commercial facilities that detract from the sense of place - Infrastructure that detract from the tourism resource value - Polluting activities or facilities with nuisance impacts - Mining and prospecting - New low density extensive residential uses 	<ul style="list-style-type: none"> - Heritage Resources Act - Upstream wastewater management - Moloto corridor - No subdivisions in conservation area - 1ha minimum subdivision size outside conservation area 	<ul style="list-style-type: none"> - Low impact design - Maintain water quality - No net loss of ecosystem function - Management guidelines for Sensitive Environments 	<ul style="list-style-type: none"> - Record and protect heritage artefacts - Water quality management strategy - Public resource protection 	<ul style="list-style-type: none"> - Water quality task team

<i>Management Zone</i>	<i>General management</i>	<i>Compatible land uses</i>	<i>Incompatible land uses</i>	<i>Design standards</i>	<i>Natural resource management</i>	<i>Actions required</i>	<i>Institutional structures</i>
<i>Rural</i>	<ul style="list-style-type: none"> - Any and all environmentally responsible land management practices 	<ul style="list-style-type: none"> - Conservancies - Tourism & recreational facilities - Grazing farms - Private nature reserves - Protected areas - Low density residential uses within serviceable distance from developed areas - Legal mining without significant impact on CBAs and tourism activities 	<ul style="list-style-type: none"> - Industrial, retail and commercial facilities (other than small-scale community services) - Land uses (cultivation etc.) that will transform large areas of natural vegetation. - Urbanisation - Mining with significant impacts on ecosystem services 	<ul style="list-style-type: none"> - Planning and design relevant to the site, resources, stewardship goal and participating land owners or occupiers - Minimum subdivision size is 20ha - Mining rehabilitation plans 	<ul style="list-style-type: none"> - No net loss of ecosystem function - Management guidelines for Sensitive Environments 	<ul style="list-style-type: none"> - Active encouragement of stewardship actions - Information access for individuals and communities 	<ul style="list-style-type: none"> - Conservancy or residents' associations - Fire protection association - Coordination between authorities on mining matters
<i>Biodiversity</i>	<ul style="list-style-type: none"> - Manage as per the draft Bioregional Plan for the City of Tshwane (Holness and Skowno, 2011) - Maintain as critical biodiversity areas in a natural condition - Maintain ecosystem services - Manage ecosystem corridors and connectivity - Enforce buffers on all freshwater resources 	<ul style="list-style-type: none"> - Conservation and associated activities. - Extensive game farming and eco-tourism operations with strict control on environmental impacts and carrying capacities, where the overall there is a net biodiversity gain. - Extensive livestock production with strict control on environmental impacts and carrying capacities. - Urban Open Space Systems 	<ul style="list-style-type: none"> - Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). - Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures). - Arable Agriculture (forestry, dry land & irrigated cropping). - Small holdings 	<ul style="list-style-type: none"> - Maintain or obtain formal conservation protection for protected areas and CBAs - No subdivisions should be allowed - appropriate zoning and land management guidelines - where possible areas should be rehabilitated to near natural conditions 	<ul style="list-style-type: none"> - Manage as per the draft bioregional plan for the City of Tshwane 	<ul style="list-style-type: none"> - Promulgate the draft bioregional plan for the City of Tshwane - Active encouragement of stewardship actions by conservancies - Ecologically and culturally sensitive tourism development - Monitoring and enforcement of natural resource management regulations and guidelines. 	<ul style="list-style-type: none"> - Conservancy or residents' associations - Fire protection association - Coordination between authorities on mining matters

TABLE 30: RESPONSIBILITIES MATRIX

Stakeholder	General	Mining	DGR	Dinokeng rural and rangelands	Agriculture	Urban	Recreation	Rural	Biodiversity
<i>The Dinokeng Project</i>	<ul style="list-style-type: none"> - Proclamation of the DGR - Subdivision policy 	<ul style="list-style-type: none"> - Negotiations - Oversight - Comments on mining applications - Action against illegal mining 	<ul style="list-style-type: none"> - Funding opportunities - Management guidelines - Strategic management - Implementation of the DGR EMP - Declaration of the DGR as a protected area 	<ul style="list-style-type: none"> - Funding opportunities - Management guidelines - Strategic management - Declaration of the rangeland area as a protected environment 	<ul style="list-style-type: none"> - Land use coordination 	<ul style="list-style-type: none"> - Advisory and oversight roles 	<ul style="list-style-type: none"> - Tourism oversight and facilitation 		<ul style="list-style-type: none"> - Oversight & coordination - Review of development applications
<i>GDARD</i>	<ul style="list-style-type: none"> - Approval, adoption and promulgation of the Metsweding EMF - Subdivision policy - Catchment management 	<ul style="list-style-type: none"> - EIA and EMPR evaluations - EIA compliance monitoring and enforcement - Comments on mining applications 	<ul style="list-style-type: none"> - Technical advice and support on conservation and environmental management matters - State veterinarian services - Compliance and enforcement - EIA evaluation and authorisation process 	<ul style="list-style-type: none"> - Rural Development Strategy (GAPA) - Technical advice and support on conservation and environmental management matters - State veterinarian services - Compliance and enforcement - EIA evaluation and authorisation process 	<ul style="list-style-type: none"> - Agricultural support - Environmental management application processes - Fine scale conservation planning - Rural Development Strategy 	<ul style="list-style-type: none"> - EIA processes 	<ul style="list-style-type: none"> - Sustainable and compatible land use decision-making 	<ul style="list-style-type: none"> - Technical advice - Land use decision-making - Rural Development Strategy 	<ul style="list-style-type: none"> - Promulgation of the Bioregional plan - Enforcement of the CBAs and ESAs - Technical guidance - EIA evaluations - Ridges policy customization - Wetlands audit and plan
<i>DME</i>		<ul style="list-style-type: none"> - Mining permits - Environmental considerations 							<ul style="list-style-type: none"> - EIA evaluations - Best practice - Adherence to

Stakeholder	General	Mining	DGR	Dinokeng rural and rangelands	Agriculture	Urban	Recreation	Rural	Biodiversity
		<ul style="list-style-type: none"> - Permit compliance monitoring and enforcement - Action against illegal mining 							requirements in the bioregional plan
DWA	<ul style="list-style-type: none"> - Catchment management - Implementation of ecological reserves - Water quality management 	<ul style="list-style-type: none"> - Water use policing - Mine monitoring - Comments on mining applications - Action against illegal mining 			<ul style="list-style-type: none"> - Demand side management - Water quality management - Water user associations 	<ul style="list-style-type: none"> - Demand side management - Integrated services planning - Stormwater management plans 	<ul style="list-style-type: none"> - Water quality monitoring - Implementation of the ecological reserves 		<ul style="list-style-type: none"> - Technical guidance - Water use licences - Wetlands audit and plan
NDA		<ul style="list-style-type: none"> - Comments on mining applications 		<ul style="list-style-type: none"> - Rural Development Strategy 	<ul style="list-style-type: none"> - Agricultural support - Subdivision applications - Rural Development Strategy 			<ul style="list-style-type: none"> - Rural Development Strategy 	-
Other government departments (e.g. DEA)	<ul style="list-style-type: none"> - Approval, adoption and promulgation of the EMF (DEA) 			<ul style="list-style-type: none"> - Participation in forums - Support to rural communities and farm dwellers 	<ul style="list-style-type: none"> - Participation in forums 	<ul style="list-style-type: none"> - Participation in forums 		<ul style="list-style-type: none"> - Participation in forums 	-
Local Authorities (esp. town planning)	<ul style="list-style-type: none"> - Update/revision of the SDF - Service infrastructure provision & maintenance - Subdivision policy - Catchment 	<ul style="list-style-type: none"> - Comments on mining applications 	<ul style="list-style-type: none"> - Adjudication of town planning applications - Adjudication of subdivision proposals 	<ul style="list-style-type: none"> - Rural Development Strategy - Adjudication of town planning applications - Adjudication of subdivision proposals 	<ul style="list-style-type: none"> - Rural Development Strategy - Adjudication of town planning applications - Adjudication of subdivision proposals 	<ul style="list-style-type: none"> - Demand side management - Integrated services planning - Formalisation of an urban edge - Stormwater 	<ul style="list-style-type: none"> - Sustainable and compatible land use planning - Water quality monitoring and management - Water quality monitoring 	<ul style="list-style-type: none"> - Land use planning and decision-making - Rural Development Strategy 	<ul style="list-style-type: none"> - Development applications - Spatial planning - Ridges policy customisation

Stakeholder	General	Mining	DGR	Dinokeng rural and rangelands	Agriculture	Urban	Recreation	Rural	Biodiversity
	management					management plans - Adjudication of town planning applications - Adjudication of subdivision proposals - Compilation of detailed SDF plans - Integrated services planning			
Utilities	- Service infrastructure provision & maintenance					- Demand side management - Integrated services planning			- Route alignments - Construction and operational best practice
Developers and land owners		- Comments on mining applications	- Land care - Self-policing - Participation in forums - Compliance with the DGR EMP	- Land care - Self-policing - Participation in forums	- Agricultural production - Land care - Water conservation - Conservation	- Design principles application - Stormwater management plans		- Environmental sustainability and responsibility	
Tourism Service providers		- Comments on mining applications	- Compliance with development guidelines - Providing quality tourism products - Compliance with the DGR EMP	- Compliance with development guidelines - Providing quality tourism products			- Co-ordination of tourist information and strategy - Marketing - Sustainable operation of facilities - Maintenance - Quality service		
Mine		- Compliance with							

<i>Stakeholder</i>	<i>General</i>	<i>Mining</i>	<i>DGR</i>	<i>Dinokeng rural and rangelands</i>	<i>Agriculture</i>	<i>Urban</i>	<i>Recreation</i>	<i>Rural</i>	<i>Biodiversity</i>
<i>operators</i>		best mining practice, EMPRs, and water use licence conditions - Water quality monitoring							
<i>Conservancies</i>		- Local policing - Comments on mining applications						- Conservation plan - Land use development control	-

7.7 Sustainability indicators, monitoring & continuous improvement

Environmental sustainability will be achieved if the environmental objectives of this chapter are adhered to. Consequently, the table below provides a framework through which aspects that are indicative of the objectives can be monitored.

Continuous improvement of environmental management, and the environment in itself, must be pursued by each stakeholder through asking the self-critical question “what have we achieved, and how can we achieve more?” Should the answer for any of the environmental categories of the table below be negative, then it would call for an assessment of whether the EMF management guidelines were applied, or an appropriate adjustment of the guidelines.

As a matter of principle, a five-yearly update and review of the EMF will assist in consolidating the information base and refining the management guidelines according to more updated environmental management objectives.

TABLE 31: INDICATORS OF SUSTAINABILITY AND MONITORING FRAMEWORK

<i>Goal</i>	<i>Subcategory</i>	<i>Indicator</i>	<i>Where and how</i>
<i>No net loss of ecosystem function</i>	<i>Grasslands</i>	Absolute protection of units >5ha Offsets for all losses	Pre/post development information and offset agreements for EIA and Town Planning authorisations
	<i>Watercourses</i>	River Health Programme EcoStatus standard	River Health Programme evaluations
	<i>Ridges</i>	No new encroachment	Pre/post development information for EIA and Town Planning authorisations
	<i>Wetlands</i>	No new encroachment Restoration of wetlands accepted as offsets for loss of previously degraded parts	Pre/post development information and offset agreements for EIA and Town Planning authorisations
	<i>Threatened or protected species</i>	Rates of decline/ improvement	Technological Services Directorate / C-Plan
<i>Integrated services planning</i>	<i>Pro-active, long term services planning (as opposed to ad hoc private development and handover)</i>	Development to follow pre-emptive planning	IDP, SDF and development applications
	<i>Infrastructure quality</i>	Roll-out to communities at minimum service standards	IDP
	<i>Environmental impacts</i>	Disruption in ecological functioning of any area that forms part of the sensitive environments management zone	Comment from Technological Services on development applications
<i>Environmental sustainability</i>	<i>Social resilience</i>	Employment in nature-based economic sectors	Periodic social surveys by management authority
	<i>Climate change risk and vulnerability</i>	Disaster prevention and response	IDP, State of Environment report
	<i>Loss in ecosystem services</i>	Capital expenditure on infrastructure that replicates	IDP, Annual Reports

<i>Goal</i>	<i>Subcategory</i>	<i>Indicator</i>	<i>Where and how</i>
		natural ecosystem functions	
<i>Community- based, tourism- led development</i>	<i>Community</i>	Growth in number of people employed in local businesses	Periodic social surveys by management authority
	<i>Tourism</i>	Growth in tourism revenue relative to other sectors	IDP

8 LEGAL AND REGULATORY PROCESS

8.1 Legal role of environmental management frameworks

The legal origin of an EMF is embedded in Section 24 (3) of the National Environmental Management Act, 1998 (NEMA) (as amended) which allows the Minister or MEC to compile environmental information and maps of particular geographical areas which must be taken into account in decision-making by authorities.

Chapter 8, part 1, of the Environmental Impact Assessment (EIA) Regulations (Regulations published in terms of chapter 5 of NEMA) provides specific regulatory requirements pertaining to the development of an EMF. It specifies that either the Minister or a Member of the Executive Council (MEC) may initiate an EMF for an area, and that a draft EMF must be subjected to a public participation process. Once the draft EMF has reviewed in the light of any representations, objections and comments received, the Minister or MEC may adopt the EMF as an environmental management tool. Adoption by an MEC, however, must be accompanied by concurrence from the Minister.

The regulations prescribe that an EMF which has been adopted must be taken into account in the consideration of applications for environmental authorisation in or affecting the geographical area to which the framework applies. However, the geographical attributes described in the EMF may be used to list activities that may or may not occur in certain areas without environmental authorisations (Section 24 (2)). Activities that are thus exempted from environmental authorisation, may be made subject to norms and standards laid down in terms of Section 10 of NEMA.

The table below provides an exposition of the various legislative reference texts that defines the role of environmental management frameworks.

: REGULATORY FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT FRAMEWORKS

Legislative Reference	Legislative Text
NEMA S24 (2)&(3)	The Minister, or an MEC with the concurrence of the Minister, (2) May identify geographical areas based on environmental attributes, and as specified in spatial development tools adopted in the prescribed manner by the environmental authority, in which specified activities may not commence without environmental authorisation from the competent authority, or may be excluded from authorisation by the competent authority May also identify activities contemplated in paragraphs (a) and (b) that may commence without an environmental authorisation, but that must comply with prescribed norms or standards. (The listing of activities must comply with the process prescribed in section 24A) (3) May compile information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes which must be taken into account by every competent authority (i.e. delegated regulatory authority)
NEMA S24 (4)(b)(vi)	Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment (commonly known as Environmental Impact Assessments) must include , with respect to every application for an environmental authorization and where applicable, consideration of environmental attributes identified in the compilation of information and maps as contemplated in subsection 24(3).
NEMA S10	The Minister, or an MEC with the concurrence of the Minister, (10) May develop or adopt norms or standards for activities, or for any part of an activity or for a combination of activities, contemplated in terms of subsection (2)(d); may prescribe the use of the developed or adopted norms or standards in order to meet the requirements of this Act; may

Legislative Reference	Legislative Text
	<p>prescribe reporting and monitoring requirements; and may prescribe procedures and criteria to be used by the competent authority for the monitoring of such activities in order to determine compliance with the prescribed norms or standards.</p> <p>Norms or standards contemplated in paragraph (a) must provide for rules, guidelines or characteristics that may commonly and repeatedly be used; and against which the performance of activities or the results of those activities may be measured for the purposes of achieving the objects of this Act.</p>
<p><i>EIA Regulations Chapter 8, part 1</i></p>	<p>Information and maps compiled in terms of section 24(3) of NEMA can be used as environmental management frameworks in the consideration in terms of section 24 (4)(b)(vi) of NEMA of applications for environmental authorisations in or affecting the geographical areas to which those frameworks apply.</p> <p>The regulations also provide specific regulatory requirements pertaining to the development of an EMF specifying that either the Minister or MEC with the concurrence of the Minister may initiate an EMF for an area. For this purpose, the Minister or MEC must compile a draft environmental management framework and subject it to a public participation process (by making the draft available for public inspection at a convenient place; and inviting potential interested and affected parties by way of advertisements in newspapers circulating in the area and in any other appropriate way to inspect the draft and submit representations, objections and comments in connection with the draft to that person or organ of state). The draft EMF should then be reviewed in the light of any representations, objections and comments received.</p> <p>In terms of the regulations, the Minister or MEC may adopt, with or without amendments, an EMF. When an EMF has been adopted, notice must be given in the Government Gazette or the official Gazette of the relevant province of (a) the adoption of the environmental management framework; and (b) the place where the environmental management framework is available for public scrutiny. Finally, the regulations prescribe that an EMF which has been adopted must be taken into account in the consideration of applications for environmental authorisation in or affecting the geographical area to which the framework applies. An EMF should therefore be regarded as a supportive instrument to assist environmental impact assessment and related decision-making processes in Metsweding</p>

8.2 Environmental Impact Assessments

As indicated, environmental management frameworks can be used as ‘geographical areas’ or as frameworks by themselves to customise environmental impact assessment regulations applicable to particular areas or zones.

Once adopted, the EMF has to inform day-to-day land development applications, including the review of EIA applications by relevant authorities. However, the management zones of an EMF can be considered as ‘geographical areas’ with specific environmental regulation and controls applicable exclusively to these areas. An example is found in the 2009 draft EIA regulations, published as Government Notices 165 to 168 in Government Gazette No. 31885 of 13 February 2009.

According to the proposed regulations, certain activities require authorisation from the relevant authority under all conditions (Notice 165, 166 and 167), whereas others only apply in ‘*specific identified geographical areas*’ (Notice 168). The areas include protected areas; sensitive areas designated by biodiversity conservation plans, areas outside urban zones, etc., and are also differentiated according to provincial application.

8.3 Adoption, implementation and application

In terms of the adoption of the Metsweding EMF, several processes need to be concluded. The EMF process has to be acknowledged and supported by GDARD as the relevant provincial authority, as only the MEC tasked with environmental affairs can legally adopt and use an EMF to ‘customise’ provincial EIA regulations. Notice must also be given to the national minister tasked with environmental affairs, who has to ultimately concur

with the findings and recommendations. Critically, a formal gazetting process must be followed for the final EMF.

The EMF, once adopted, will have to be taken into consideration in environmental impact assessments in or affecting the geographical area to which the framework applies. The information and guidelines contained in the EMF may, however, be used to inform decision-making and spatial planning in the City of Tshwane after Metsweding has been amalgamated with or without the final concurrence of the Minister. The SDF and IDP review cycles, in particular, should draw on the EMF information to refine and add detail to the current planning processes.

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