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Environmental Affairs
REPUBLIC OF SOUTH AFRICA



**DINOKENG PROJECT:
DEPARTMENT OF ECONOMIC DEVELOPMENT**

**ENVIRONMENTAL MANAGEMENT FRAMEWORK
AND ENVIRONMENTAL MANAGEMENT PLAN FOR
THE DINOKENG PROJECT AREA**

Final EMF Report

March 2010

DEPARTMENT OF ECONOMIC DEVELOPMENT

ENVIRONMENTAL MANAGEMENT FRAMEWORK AND ENVIRONMENTAL MANAGEMENT PLAN FOR THE DINOKENG PROJECT AREA

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This Environmental Management Framework was prepared with the kind co-operation of the various authorities involved in the Dinokeng Area:

National Department of Environmental Affairs
Gauteng Department of Economic Development
Gauteng Department of Agriculture and Rural Development
Metsweding District Municipality
Nokeng Tsa Taemane Local Municipality
City of Tshwane Metropolitan Municipality

EXECUTIVE SUMMARY

The Dinokeng Project aims to create a self-sustaining local tourism economy in the north-eastern reaches of the Gauteng Province. Core to the project is the establishment of a Big-5 collaborative game reserve, with a mix of land uses in the surrounding area ranging from high density urban development to diverse tourism establishments.

In support of this objective, this **Environmental Management Framework** is compiled, to ensure that the development patterns take cognisance of and do not compromise the long term viability of the natural and social resources of the area. In essence, it 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 Dinokeng Area.

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 southern parts of the study area are rapidly degrading due to mining activities, densification and land transformation. This process of habitat loss and transformation designates the southern areas as the most sensitive part of the Dinokeng Area. From a desired state perspective, it becomes obvious that the preservation of endemic species and veld types will necessarily remain in conflict with the inevitable expansion of typically urban development activities, agricultural expansion, mining and the need for bulk services infrastructure. Management of the conflicts is required in the form of appropriate land use change decision-making that uses the protection of biophysical resource quality as a means to

preserve ecosystem services such as stormwater management, pollination, climatic control and aesthetic desirability.

An **audit of mining activities** in the Dinokeng Area identified many mining sites, both active and inactive, that will affect other land uses and overall development plans for the area. Of particular consequence are mining activities and prospecting rights within sensitive areas or areas that are earmarked for land uses that are generally incompatible with surface mining activities. The information should now be used to facilitate stakeholder communication as well as concrete monitoring and control over mining activities.

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. Six management zones are identified for the area, namely:

1. Dinokeng Game Reserve
2. Dinokeng Rural North
3. Cultivation Zone
4. Development Corridors and Consolidation Areas
5. Roodeplaat Recreation Area
6. Dinokeng Rural South

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 **Strategic Environmental Management Plan** 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.

In terms of **spatial planning**, the assessment indicates that urban expansion makes practical sense south of Roodeplaat Dam, and between Rayton and Refilwe, but no new clusters should be established. Furthermore, the envisaged **Moloto Rail Corridor** should be considered as a potential asset to the tourism industry if a station is added in a central location. Otherwise, the railway will simply operate as a mobility spine rather than a development corridor.

A particularly important consideration in terms of regulatory structures is the impending **incorporation of the area into the municipal boundary of the City of Tshwane**. This realignment of municipal responsibility will facilitate catchment management practices up-and-downstream of Roodeplaat Dam, and the application of both town planning and engineering services standards over a larger service area.

In terms of the legal and regulatory status of the environmental management framework and the Dinokeng Area in general, several recommendations are made:

- a) The management framework must be submitted for concurrence from the National Minister of Water and Environmental Affairs, followed by adoption by both the Provincial MEC tasked with environmental affairs and

the relevant Municipal Managers and Mayors.

- b) The spatial and management recommendations from the framework must be used to inform spatial development planning and land use management decision-making at both provincial and local levels, and must be incorporated into the municipal spatial development frameworks.
- c) Customisation of the provincial Environmental Impact Assessment requirements may follow, based on the management actions proposed for each management zone.
- d) An inter-governmental forum should be established between the relevant government departments and authorities to deal with the assessment of mining applications, as well as monitoring, compliance and rehabilitation in terms of legislation and permit requirements.
- e) The Dinokeng Game Reserve must be proclaimed as a protected area under the Protected Areas Act, either as a nature reserve or a protected environment.

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ABBREVIATIONS

CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBT	Community-based tourism
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CoT	City of Tshwane
C-Plan	Gauteng Conservation Plan
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism (see DEA)
DED	Department of Economic Development
DFA	Development Facilitation Act (Act 67 of 1995)
DGR	Dinokeng Game Reserve
DITDF	Dinokeng Integrated Tourism Development Framework
DPA	Dinokeng Project Area
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry (see DWA)
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EMPR	Environmental Management Programme Report
GAPA	Gauteng Agricultural Potential Atlas
GDACE	Gauteng Department of Agriculture, Conservation and Environment (see GDARD)
GGP	Gross Geographic Product
GIS	Geographic Information System
GDARD	Gauteng Department of Agriculture and Rural Development
GSDF	Gauteng Spatial Development Framework
I&AP	Interested and Affected Parties
IDP	Integrated Development Plan
IUCN	International Union for the Conservation of Nature & Natural Resources
LED	Local Economic Development
LSU	Large Stock Unit
MEC	Member of the Executive Council
MPRDA	Mineral and Petroleum Resources Development Act (Act 28 of 2002)
NEGI	North-Eastern Gauteng Initiative
NEMA	National Environmental Management Act (Act 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act (Act 57 of 2003)
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NR	Nature Reserve
NSBA	National Biodiversity Spatial Assessment
NWA	National Water Act (Act 36 of 1998)
PE	Protected Environment
RDP	Reconstruction and Development Programme
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANDF	South African National Defence Force
SDF	Spatial Development Framework
SEMP	Strategic Environmental Management Plan
SMME	Small, Medium and Micro Enterprises
SSI	Stewart Scott International Engineers and Environmental Consultants

1 INTRODUCTION

1.1 Project context

SSI Engineers and Environmental Consultants (trading as Bohlweki – SSI Environmental) was appointed by the Gauteng Department of Economic Development’s Dinokeng Project to assist with the development of an Environmental Management Framework (EMF) and Strategic Environmental Management Plan (SEMP) for the Dinokeng project area (hereafter referred to as ‘the Dinokeng Project Area’ or DPA).

Dinokeng is a government initiative to create a premier tourism destination in the north-east of Gauteng and some small sections of the adjacent provinces of Mpumalanga and Northern Province (Figure 1). The bulk of the area corresponds with the boundaries of the Nokeng Tsa Taemane Local Municipality. The initiative was formerly known as NEGI (North-eastern Gauteng Initiative). The objective is to promote socio-economic development, particularly for historically disadvantaged communities, through the development of an ‘All of Africa’ tourism destination. Government will seed the development to stimulate and attract private sector investment, but ultimately the project aims to become a self-sustaining tourism-based local economy.

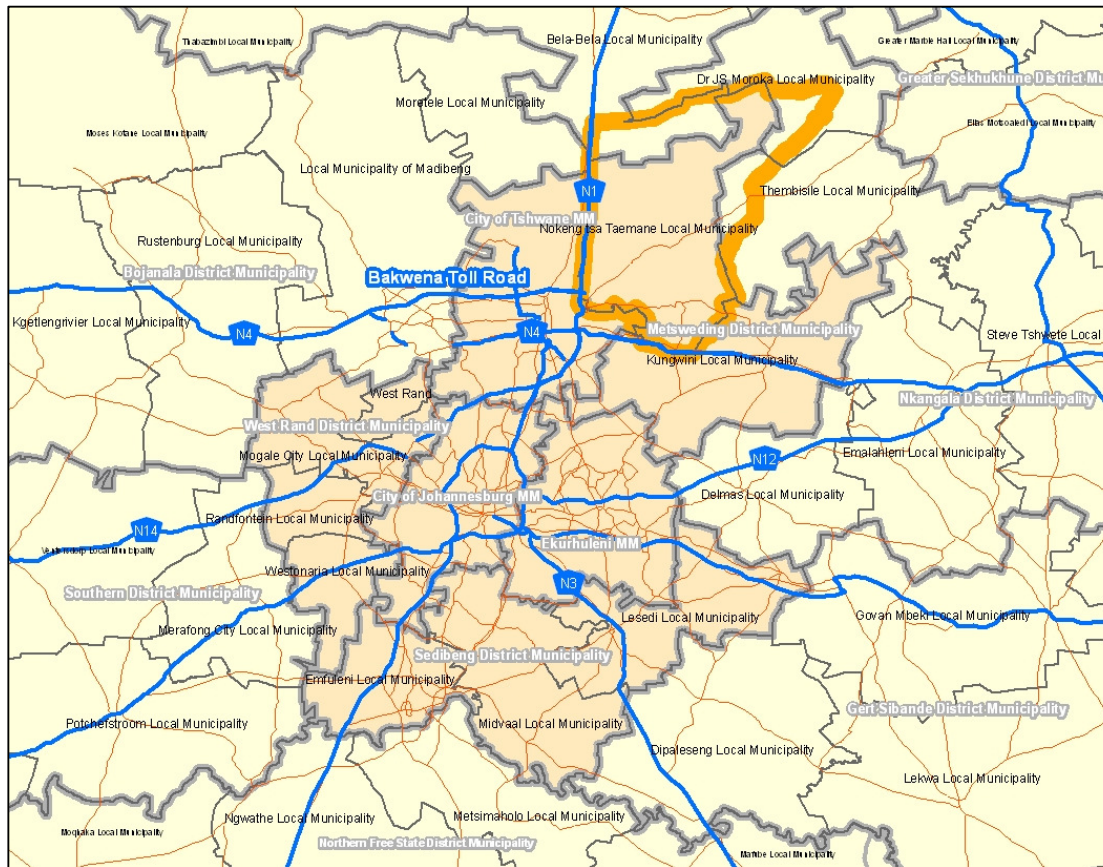


Figure 1: Provincial context of the Dinokeng Project

The area is situated beyond the provincial urban edge to the north-east of the City of Tshwane, yet an increasing number of development applications have been received by the regulatory authorities indicating a growing demand for more formal development in the area. Due to the increasing development pressure within this area, it was evident that the Dinokeng Project and the Gauteng Department of Agriculture and Rural Development (GDARD, previously known as the Department of

Agriculture, Conservation and Environment, or GDACE) need to jointly develop a strategic environmental plan for the area to ensure that development does not compromise the environmental features and resources of the area. It was consequently decided that an Environmental Management Framework would be compiled, in order to satisfy this requirement for strategic spatial management guidance.

As such, an EMF is a framework 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.

Therefore, the purpose of this EMF is to provide a framework which will inform the Integrated Development Planning (IDP) process and Spatial Development Frameworks (SDF) within Dinokeng, as well as to provide a framework for decision-making through:

- a) Providing definitive criteria for decision-making,
- b) Providing an objective environmental sensitivity overview,
- c) Defining and categorisation of environmental, social and heritage resources, economic and institutional aspects, and
- d) Formulation of management guidelines.

During November 2008, the Status Quo phase of the project was concluded with the first round of public participation. Feedback that was received was incorporated into the Status Quo Report, and informed the commencement of the desired state phase. The information generated during the desired state phase then informed the management strategy and final environmental management framework.

1.2 Project phasing

The basic approach in this project is the use of multi-disciplinary expertise to perform various specialised elements of the work scope, with a core group of strategic environmental planners responsible for the integration of the various contributions. As indicated in Figure 2, the process of compiling the Dinokeng EMF proceeded through a number of analysis phases, namely:

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

Each phase built on the findings of its predecessor, as well as the inputs from stakeholders in the Dinokeng Project area, 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.

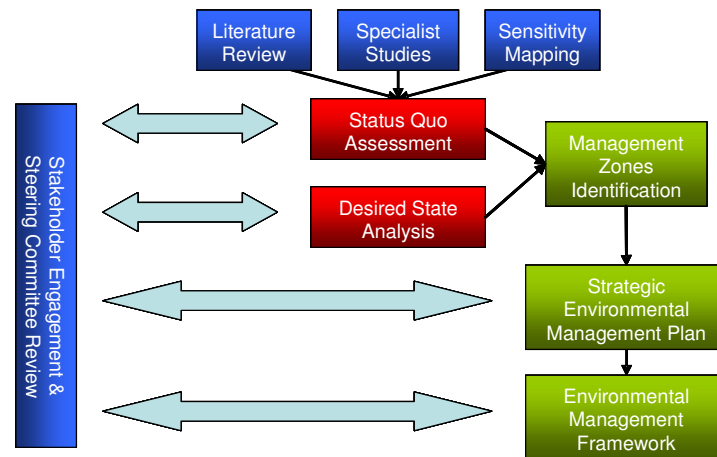


Figure 2: Schematic diagram of the Dinokeng EMF compilation process

The different project components are developed as follows:

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. The primary reporting output is the Status Quo Report. At the same time, a Geographic Information Systems (GIS) team is responsible for a GIS interface that holds all the relevant information about the Dinokeng area 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.

Desired State Analysis

The Desired State phase is preceded by Public Participation, where comments on the Status Quo report and input into the Desired State analysis are collected from stakeholders in the Dinokeng area (November 2008). It takes the form of a Public Open Day as well as focussed 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.

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 immediate development trends and environmental requirements in Dinokeng. These are highlighted as discrete management zones that form the basis for pro-active environmental management in the study area. The various management zones are used as geographical management areas to determine where and how certain development activities should take place, and consequently to inform an overall environmental framework and strategic environmental management plan. The SEMP provides the guidance necessary for land use planning and environmental decision-making, but stops shy of prescribing detailed design measures.

Final Dinokeng EMF

A second and final round of Public Participation (August 2009) 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 which is scheduled to encourage participation from a range of stakeholders in the Dinokeng area.

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 Environment in Gauteng.

1.3 Environmental Management Framework vs. Municipal Spatial Planning

As a strategic environmental spatial planning exercise, environmental management frameworks should not be seen as a replacement or 'competition' for traditional planning processes and products. They should rather be accepted as critical components of municipal spatial planning processes, aimed at advancing sustainable development through a holistic planning platform. EMF projects function in the same space as regional planning initiatives such as regional or district Spatial Development Frameworks and therefore serve to enhance the planning frameworks. As a matter of course, the EMF process leads to a more integrated planning platform, by bringing stakeholders together in both a physical and virtual environment.

Traditional spatial planning processes are typically located within the Town & Regional Planning sphere, which is not capacitated for a thorough analysis and understanding of environmental resources. This creates the need and opportunity for EMFs to feed strategic environmental planning information into planning processes. The environmental planning information is provided both in the form of an accessible summary of environmental issues, and spatial planning guidance that maximises the potential benefits that can be derived on a sustainable basis from natural resources. Environmentally sensitive spatial planning will be able to avoid natural hazards and sensitivities, whilst maintaining the valuable ecosystem services derived from a functional intact ecological system.

In the case of Dinokeng, the EMF will also provide further focus for the stated objective of directing planning towards a self-sustaining tourism based economy. The EMF will identify resources and set utilisation parameters that will ensure a sustainable development of the various nature-based activities. This will therefore inform planning decisions and policy that directly or indirectly affect, or are affected by, the natural resources.

In the current context, therefore, the Dinokeng EMF and the local and regional SDF processes should be related in the following manner:

- The EMF interprets SDF planning in order to improve it on the basis of environmental sustainability
- The SDF draws environmental guidance from the EMF
- Property-level guidance in the EMF will be dependent on the identification of specific environmental control features on individual properties, but otherwise remains indicative
- The SDF retains the mandate and responsibility for detailed planning for different land uses on specific properties, but the EMF will provide an indication of the restrictions or opportunities provided by the natural environment
- The EMF will inform planning of boundary determinations such as urban edge delineation

2 STATUS QUO ASSESSMENT

The Dinokeng EMF study kicked off with the Status Quo Assessment which outlined the current environmental and socio-economic situation within the Dinokeng Project Area by means of a literature review and various specialist analyses. The Status Quo report¹ has highlighted a number of key issues within the Dinokeng Project Area, a summary of which is presented here.

2.1 Legal review

The environmental legal review identified useful legal instruments and measures which may assist the Dinokeng Project in achieving the objectives of the EMF and facilitating sustainable development of the Dinokeng area. The current environmental legal framework provides various legal means to the Dinokeng Project Team to address risks to the sustainable development of the Dinokeng Project Area. However, in the context of the Dinokeng Project and EMF, the importance of co-operative governance is stressed as being essential to achieving the overall vision and objectives of the Dinokeng Project.

Legal origin and nature of the EMF

It is the opinion of the consultants that an EMF is not a binding document *vis-a-vis* third parties *per se*. An applicant and/or an assessment practitioner and competent authority assessing an application for environmental authorisation does, however, have the obligation to take a relevant EMF into account in accordance with the National Environmental Management Act (Act No. 107 of 1998)(NEMA) Section 24(4)(b)(vi) and Chapter 8 of the Environmental Impact Assessment (EIA) Regulations (Regulations published from time to time under Section 24(5) of NEMA).

If the Dinokeng Project Team requires a more formal and binding management instrument to manage development activities in the Dinokeng Project Area, the EMF may be used to identify the area in terms of sections 24(2)(b) and (c) of NEMA. These sections state that the Minister, and every MEC with the concurrence of the Minister, may identify geographical areas based on environmental attributes in which specified activities may not commence without environmental authorisation from the competent authority, or where specified activities may be excluded from authorisation by the competent authority.

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 Chapter 3 of the EIA Regulations the applicant (and more specifically the Environmental Assessment Practitioner) 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, which could in this case include the Dinokeng Project. However, the Dinokeng Project should liaise with other relevant authorities to ensure that it is notified of any new EIA applications in or close to the Dinokeng area. It is important for the Dinokeng Project to be listed as an Interested and Affected Party (I&AP) in the context of EIA in the Dinokeng area.

The legislation also provides the possibility for the Dinokeng Project to appeal a record of decision which it believes will impact negatively on the sustainable development of the Dinokeng area and Dinokeng Project.

¹ The full Dinokeng EMF Status Quo Report was submitted separately to the Gauteng Department of Economic Affairs.

The Development Facilitation Act (Act No. 67 of 1995) (DFA) also provides the possibility for the Dinokeng Project to request an investigation in terms of activities which are believed to have been performed contrary to the procedures prescribed in the DFA.

Roles and responsibilities of the relevant authorities in the context of the EMF and the Dinokeng Area

The following inter-governmental forums could be used and/or established to assist the Dinokeng Project to facilitate the achievement of the objectives of the EMF and the Dinokeng Project:

- the Gauteng Premier's Inter-governmental Forum,
- the relevant District Inter-governmental Forum,
- a Provincial Inter-governmental Forum,
- an inter-provincial forum,
- an inter-municipal forum, and
- an inter-governmental support structure

It could also be an option for the Dinokeng Project to liaise with the relevant authorities to stimulate the establishment of an 'implementation protocol' for the Dinokeng Project and/or Dinokeng Project Area.

Biodiversity management

The following mechanisms/ instruments found in the National Environmental Management: Biodiversity Act (NEM:BA)(Act 10 of 2004) could efficiently assist the Dinokeng Project Team to achieve the objectives of the Dinokeng Project:

- Declaration of the Dinokeng area as a Bioregion;
- Development of Biodiversity plan for the Dinokeng area; and
- Implementation of a Biodiversity Agreement for the Dinokeng area.

Protected areas management

The declaration of a nature reserve and/or the declaration of a protected environment under the National Environmental Management: Protected Areas Act (NEM:PAA)(Act No. 57 of 2003) could be the most suitable to protect the Dinokeng area and achieve the objectives of the Dinokeng project. It is also suggested that the Dinokeng Project should assess the most suitable entity to manage the protected areas in the Dinokeng area. The Dinokeng Project could take this responsibility or opt for the implementation of a co-management agreement.

Management of heritage resources

A nomination of places in the Dinokeng area would be necessary for such sites to be declared a national or provincial heritage sites under the National Heritage Resources Act (NHRA)(Act No 25 of 1999). The NHRA provides for effective general protection of monuments, burial grounds and graves which should assist the realisation of the objectives of the Dinokeng project.

Water management

The National Water Act (NWA)(Act 36 of 1998) prescribes tools (e.g. water use licence), measures, and principles which should assist the Dinokeng Project in protecting water resources in the Dinokeng area.

Management of mining activities

The current mining legislation, including the National Mineral and Petroleum Resources Development Act (MPRDA)(Act 28 of 2002) does not provide adequate legal means (especially for the Dinokeng Project) to alter mining activities which have been duly authorised by the relevant authority, in the Dinokeng 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 provide 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 the Dinokeng Project itself as there are usually defined mandates allocated to responsible parties. It is suggested that the Dinokeng Project should liaise with the relevant authorities to improve collaboration in terms of the management of mining activities in the Dinokeng area. As such it is proposed that an inter-governmental forum be established to deal with the assessment of mining applications, as well as monitoring, compliance and rehabilitation in terms of legislation and permit requirements

NEMA, NEM:PAA, NEM:BA and NHRA do provide various legal instruments which could assist in the regulation of *new* mining activities in the Dinokeng area. The NEM:PAA provides for the control and limitation of activities in protected areas according to the type of protected area. Therefore, the Dinokeng Project Team could use one of the instruments to enable the control and limitation of mining activities in the Dinokeng 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 a Management Authority to limit mining developments in the area.

Currently the EIA regulations (GNR 386 and 387) in terms of NEMA are not yet applicable to mining activities. There is consequently no statutory obligation *per se* to take into consideration the EMF in the application process for mining activities. However, the Dinokeng Project should review and comment on the environmental management plans and programmes of proposed mining developments in or around the Dinokeng area.

It should be noted though that the EIA regulations are being revised, and the 2009 proposed amendments to the NEMA EIA regulations propose to include mining activities in the spectrum of EIA in terms of NEMA, which will directly result in the obligation to consider the EMF in EIAs related to mining activities. Such amendment will advance the objectives of the Dinokeng Project.

Land Claims

Various properties in the study area are subject to land claims in various stages of resolution. Some of the claims are located in the proposed Dinokeng Game Reserve (DGR) area. Case history suggests that these claims can still take quite some time to come to final decision and settlement. An immediate response or accommodation of the claims is therefore impossible. The cases need to be resolved in accordance with all due processes, but the opportunity does exist to have the final negotiated settlements take into consideration the socio-economic context and development trajectory envisaged for the Dinokeng Project.

The 2008/2009 Nokeng Tsa Taemane IDP provides the following summary of land claims in the municipality:

Table 2-1: Land Claims in Nokeng Tsa Taemane (2008/2009 IDP)

LAND CLAIM	STATUS
<i>Wallmansthal</i>	This land claim has been resolved and the outstanding matters are; preparation of title deeds for all beneficiaries, land use planning and development of business case for use of land. Memorandum of agreement already signed between municipality, minister of land affairs and community representatives.
<i>Onverwacht</i>	This land claim has been resolved. Outstanding issues: Formalisation of the settlement and development of business case for use of land
<i>Ellison and Steinberg</i>	This land claim has been resolved. Outstanding issues: Formalisation of the settlement and development of business case for use of land
<i>Jakkalsdans</i>	This land claim has not yet been confirmed by Gauteng Land Claims Commission however it appears that the claim has been gazetted. It is probable that the claim might be part of Mpumalanga Land Claims Commission and was not transferred to Gauteng after delimitation of municipal and provincial boundaries.

2.2 Spatial planning and land-use

Spatial planning and land-use in Dinokeng is characterised by a lack of shared understanding and co-operation between the Nokeng tsa Taemane Local Municipality and the Dinokeng Project who are responsible for development and management of the area. This is demonstrated through the conflicting development frameworks governing parts of the Dinokeng study area, as well as the differing standards for subdivisions within the various development frameworks. Similar conflict is also evident with regards to the current demarcation of urban boundaries in the study area. According to the official provincial urban edge delineation, the 'Roodeplaats urban core area' indicated in the Nokeng tsa Taemane SDF is excluded from the urban edge.

Threats to the Dinokeng vision come from both approved land uses that do not conform to the Dinokeng vision and illegal land uses on farm portions, in combination with the shortage of institutional capacity at the municipal level to address illegal land uses and manage new development in accordance with the Dinokeng vision.

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 conditions. Ultimately, if these environmental impacts are not properly managed they will impact on the tourism potential of Dinokeng.

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

The region experiences high levels of urbanisation and the spread of urban areas to the rural periphery impacts 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 area as a tourism destination has been highlighted as the most economically, socially and environmentally beneficial land use for the area. Existing plans include the expansion and creation of tourism routes to facilitate access to, and connect nodes found within

settlements that have high levels of poverty and unemployment (e.g. Dinokeng Integrated Tourism Development Framework, Metsweding IDP).

2.3 Socio-economic state

Most of Dinokeng falls in Nokeng tsa Taemane Local Municipality. This municipality displays a largely urban socio-demographic profile, similar to that of its neighbouring metropolitan municipality, the City of Tshwane (CoT), which is not reflected in the land use profile. This may be ascribed to the profile of people who migrate to these areas. As part of Metsweding District Municipality, this municipality together with Kungwini Local Municipality showed in-migration constituting the highest percentage of the total population. 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 are taking place in the area, and seem to be mainly driven by a need of people to escape from the threat of 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.

The continued expansion and realisation of the Dinokeng project is likely to have positive impacts on the status quo of residents living in this area. With a vision that prioritises strategic economic infrastructure, the development of tourism offerings, public-private partnerships, community involvement, small, medium and micro enterprises (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. The Dinokeng Project's mandate is limited to tourism development (through investment in strategic tourism infrastructure), and not delivering such things as housing, education, water, sanitation or electricity. Local government structures need to play their part here and ensure that they fulfil their own mandate and functions in order to complement the Dinokeng Project's efforts and thereby assist in an integrated and sustainable development for the area as a whole.

2.4 Cultural-historic heritage

The cultural heritage of Dinokeng is a non-renewable resource. Cultural heritage resources are nationally important and should be protected and conserved as far as possible. Considerable degradation of especially living heritage resources however takes place during various forms of development, largely due to ignorance or inadequate documentation.

The area is considered to have a high tourism potential comprising natural, cultural and historical resources. The attractiveness of the area is that it contains a rich natural and cultural diversity attached to the Magaliesberg and rocky outcrops in the study area. Dinokeng's cultural and historical heritage includes Iron and Stone Age sites, relics of colonial diamond mining activities and Anglo-Boer War and World War II sites, as well as its history of black oppression and forced removal. Pro-active utilisation and development of the Dinokeng cultural heritage resources will to a large extent depend on how resources are identified, developed and utilised.

2.5 Biophysical conditions

The Dinokeng study area lies across the Gauteng and Mpumalanga Provincial boundaries. Environmental sensitivity data for the area has generally been generated at a provincial level (Gauteng Conservation Plan (C-Plan) and Mpumalanga Conservation Plan) which has resulted in inconsistencies and gaps in the data. In order to overcome this and ensure consistency during the analysis it was necessary to develop a model for ecological sensitivity.

The most robust method of determining the sensitivity was by using a combination of the sensitive environmental features and the biodiversity fragmentation index developed as part of the National Biodiversity Spatial Assessment or NSBA (SANBI, 2004). The sensitive environmental features include the priority vegetation types (Springbokvlakte Thornveld, Marikana Thornveld and Rand Highveld Grassland), ridge systems, rivers and wetlands.

Based on the analysis and associated map (**Annexure A: Map 1 - Status Quo Summary: Ecological Sensitivity**) it becomes clear that the Dinokeng Project Area provides suitable habitat for numerous threatened floral, faunal and invertebrate species. The environmentally sensitive areas/hotspots include Nature Reserves, Conservancies, rivers and drainage lines, riparian buffer zones, wetlands, natural vegetation areas and rocky ridges and hills. It is evident from the various assessments that the study area is representative of a high and intricate biodiversity as a result of the grasslands-bushveld ecotone, which is similarly supported by a diverse physical, geological and mineral landscape, as well as rich cultural/ historical past.

In addition, the habitat supports unusual reptile, mammal and insect species, often restricted to the project area range. Threats to this biodiversity include habitat destruction, fragmentation and degradation due to increased urban development, mining and quarrying, inappropriate intensive agricultural activities and alien plant invasion.

Water quality in and around Roodeplaat 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 Kungwini (DWAF, 2003). 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 generally has more evident 'nuisance' value than continuous serious health and environmental risks, as the decomposing matter leaves a rotting smell, and the floating vegetation clogs machinery.

The increased contaminant load, algal mass and organism die-off do, however, have the potential to pose serious ecological and health related impacts as certain types of cyanobacteria pose the risk of the release of cyanotoxins that are harmful to humans and animals. Decomposing animal and plant material further increases the likelihood of the spread of pathogens or their vectors.

The two wastewater treatment plants that discharge more or less directly into Roodeplaat 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, Roodeplaat 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 pump stations) due to fragmented planning.

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. Other factors affecting the surface water quality, and in turn the biodiversity of the region, include impoundments and dams, along with soil erosion, agricultural and mining activities, chemical and bacterial pollution and urban expansion. Development encroachment onto the watercourses and wetlands in the dam's catchment area further reduces the amount of natural water purification that can take place.

Wetlands are 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.

The value of an intact, ecologically functioning natural resource base is generally underestimated. Ecosystems provide benefits to society such as the pollination of crops and natural vegetation, purification of water, flood attenuation and nutrient cycling. In the Dinokeng area, where the bulk of the local economy is directly related to the natural resource base, these services need to be fully appreciated. In particular, nearly all tourism activities or attractions are nature-based, and therefore will benefit from an ecosystem that is attractive, can 'take care of itself', whilst at the same time providing additional ecosystem services to various land uses.

Ecosystem services fall into four categories:

- provisioning services (e.g. water, food, drugs and genetic resources),
- regulating services (e.g. flood attenuation, herbivory, pest control and pollination),
- supporting services (e.g. primary production, nutrient cycling), and
- cultural services (e.g. recreational, spiritual and cultural benefits).

In consideration of the description of the various bio-physical features found in the study area, it can be seen that any future development of the area will be dependent on all four categories of services. Every reduction in the ecosystem services that are provided will imply that the service has to be acquired artificially or imported from outside the area, resulting in an inevitable financial burden.

With the focus on nature-based tourism, and a local economy that is based on primary resources, the area will rely on existing protected areas, as well as the expansion thereof in order to lay a foundation for the provision of ecosystem services. Whilst undeveloped or vacant land parcels contribute to the ecological reserve, there exists a higher likelihood that the ecological state will be managed appropriately within officially protected areas. These areas are more likely to have management plans in place, and as larger contiguous areas can ensure a greater resilience for species and habitats.

2.6 Mining

An audit of past and current mining activities formed part of the EMF status quo assessment in an attempt to supplement the desktop analysis of mining permitting processes conducted on behalf of GDACE in 2007 (GDACE, 2007a) with actual verified data. The audit found that total of 428 individual mining sites are present in the Dinokeng Area. Of these, 184 mines are active and 244 closed (see Figure 3). 164 of the closed mines can be considered as rehabilitated with the remaining 80

unrehabilitated. For the purposes of this study, 'rehabilitated' is considered to be mine workings where at least 75% indigenous vegetation cover is present and the site does not show signs of active erosion.

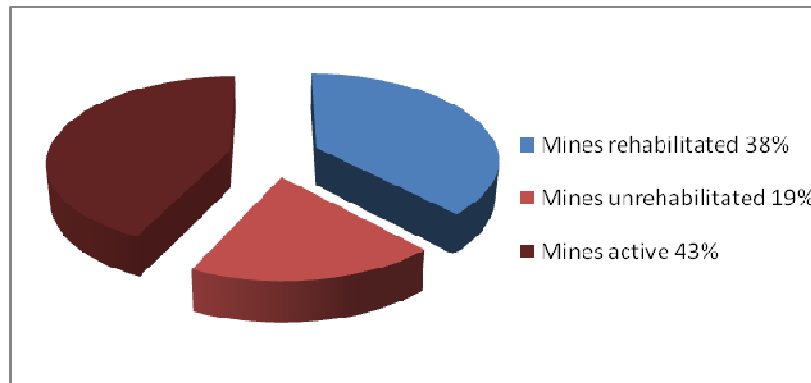


Figure 3: Percentage of active, unrehabilitated and rehabilitated mines in the Dinokeng area

Mining operations range from large scale commercial mines such as the Vergenoeg Fluorspar, Cullinan Diamond and Delfsand Silica Mines to the various informal sand and road building material mines scattered over the area. Cullinan Diamond Mine (previously Premier Mine) is by far the largest mine in the Dinokeng area and a prime example of the social, economic and infrastructural impacts that a large mine can have on an area. The urban areas of Cullinan and Refilwe were established as a direct result of the opening of the original mine and has grown to become a regional service centre.

As evident from (Figure 4), sand is by far the most common mineral extracted (61% of mines) followed by road building material (25% of mines) and clay (9% of mines). Minerals historically mined in the area include tin, lead, molybdenum, copper and zinc, along with minor amounts of gold and silver. Most of the mineral resources in the area occur at a relatively shallow depth resulting in mostly open cast mining operations throughout the area.

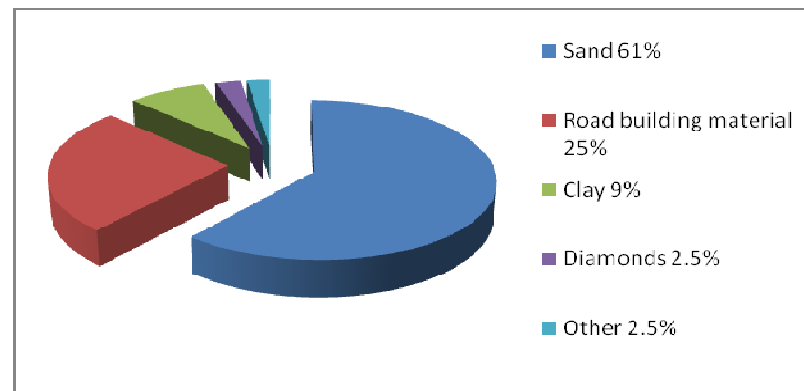


Figure 4: Type of mineral as a percentage of mines in the Dinokeng area

Impacts associated with mining in the area can broadly be grouped into the following categories:

- Loss of vegetation cover and habitat;
- Hydrological impacts;
- Increased sedimentation and erosion;

- Pollution associated with mining operations; and
- Introduction of invader plant species.

A more detailed analysis of typical mining impacts is found in the Metsweding Mining Audit (GDACE, 2007a) and the Mining and Environmental Impact Guide (GDACE, 2008). The Metsweding audit describes the following cumulative impacts resulting from mining activities:

Potential Cumulative Impacts	
<i>Cumulative Impacts</i>	<ul style="list-style-type: none"> • Dust and atmospheric emissions; • Noise impacts; • Increased sediment loads in storm water run-off; • Extraction of ground water; • Ground water pollution as a result of waste management facilities; and • Aesthetic impacts as mining progresses.
<i>Primary effects of these impacts can include;</i>	<ul style="list-style-type: none"> • Loss of riparian and agricultural land, • Habitat fragmentation, • Aesthetic impacts, • Demands on social and municipal infrastructure, • Informal housing, and • Increased road traffic,
<i>The secondary effects that stem from the primary level effects include;</i>	<ul style="list-style-type: none"> • Decline in agricultural output, • Decline in the protection of river banks against erosion and flooding, • Potential interruption of the water table and river channels, • Impacts on vegetation, • Decline in species, • Decline in human health and well being, and • Air-, noise- and water pollution (stemming from informal housing and increased traffic),
<i>Various combinations of these effects ultimately have the potential to give rise to tertiary effects such as;</i>	<ul style="list-style-type: none"> • Decline in the tourism potential of an area, • High sediment loads in streams and rivers making them unsightly as increasing sediment loads trapped in dams and wetlands downstream, • Negative impact on the quality of life for the surrounding areas, • Social costs, and • Loss of biodiversity.

3 DESIRED STATE ANALYSIS

3.1 Compilation of the Desired State

The formulation of a desired state report for the Dinokeng Project area 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 two Public Open Days and in the form of focussed consultation meetings. These were intended to allow 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 Dinokeng 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, management objectives, legal and policy requirements, and development needs. 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.

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.

3.1.3 Vision for the Dinokeng Project Area

Dinokeng is an initiative of the Gauteng Provincial Government that aims to establish a premier tourist destination close to the urban centres of Gauteng. The project will promote economic growth, job creation and social upliftment through conserving and developing the historical, natural and cultural heritage of the area and enable many South Africans to experience tourist attractions and resources for the first time.

3.2 Management objectives for identified features

3.2.1 Sensitive natural environments

3.2.1.1 Current state

The study area is representative of a high and intricate biodiversity as a result of the grasslands-bushveld ecotone, which is similarly supported by a diverse physical, geological and mineral landscape. Sensitive environments include proclaimed nature reserves, private nature reserves,

conservancies, permanent wetlands, perennial rivers (Elands River and Pienaars River), non-perennial rivers/ streams (Elandspruit, Hartebeestspuit, Premiermynloop, Rooispruit and Krokodilspruit), dams (Roodeplaat, Rust-de-Winter, Mkhombo), seasonal wetlands (pans and drainage lines), primary vegetation, rocky ridges and hill systems. The majority of threatened faunal species are likely to occur in these habitats.

Areas outside the DPA and conservation areas especially around the southern portions have extensive habitat transformation due to agricultural intensification (mostly maize farming) as well as mining and urbanisation. The majority of sensitive or secretive animal species including mammals, birds, reptiles and amphibians would have disappeared from these transformed agricultural habitats with some species having succeeded to migrate (immigrate) into the remaining natural areas. In general, population densities will be below natural population densities, although some concentrations above natural density could result from developmental pressure. The conversion of grassland into maize and wheat land has a negative impact on natural grasslands. Seed eating (granivorous) species such as queleas, doves and bishops largely benefit from maize and wheat crops as these supply food in large quantities to them. Many of these species flock in large numbers on fields and indeed become pests. The birds least likely to be affected by this transformation of grassland to agricultural field are the smaller species that are able to persist in small fragmented remnants of undisturbed habitats. Species most likely to show disrupted patterns of distribution are the larger species with larger home ranges (Barnes, 2000). Some Red Data² species such as the Blue Crane have been observed to forage and breed on agricultural lands and fields (Barnes, 2000).

Watercourses

The surface waters from the south-western and western areas are drained primarily north-westwards to eventually flow into the Crocodile River, to flow northwards into the Limpopo River. The surface waters of the south-eastern and eastern areas flow northwards and eastwards to drain into the Olifants River. The Olifants River flows north-eastwards and eventually eastwards through the Kruger National Park and into Mozambique, after which it forms a confluence with the Limpopo River. The Limpopo River flows eastwards, through Mozambique, into the Indian Ocean. The Dinokeng area forms part of the source of these major river systems which supply water resources that are shared trans-nationally and therefore could be regarded as an important conservation area in terms of surface water resources that needs to be appropriately managed to allow the systems to fulfil their ecological and conservational potential.

The perennial rivers (Elands River and Pienaars River) and non-perennial rivers/ streams (Elandspruit, Hartebeestspuit, Premiermynloop, Rooispruit and Krokodilspruit) must all be considered as sensitive environments. The drainage lines are considered to be of conservation importance for the following reasons:

- The indigenous vegetation of rivers (riparian vegetation) within the old Transvaal Province, and wetlands in general throughout the Grassland Biome, is in danger of being completely replaced by alien invasive species. Any remaining areas of indigenous riparian vegetation or marshland vegetation within Gauteng must therefore be regarded as sensitive habitats; and
- Drainage lines are longitudinal ecosystems, and their condition at any point is a reflection of not only upstream activities, but also of those within adjacent and upstream parts of the

² The designation 'Red Data' indicates that a species has been listed on the IUCN (International Union for the Conservation of Nature & Natural Resources) Red List of Threatened Species™ as Critically Endangered, Endangered or Vulnerable, and therefore at risk of global extinction.

catchment. Any impact on the drainage line within the study area is therefore also likely to impact on upstream and downstream areas.

Land use in the Dinokeng area is dominated by agriculture of varying scales. Historically, emphasis was placed on agriculture (dominated by agronomy) that required a large amount of irrigation. This resource need was historically satisfied by the Department of Water Affairs and Forestry (DWAF, now the Department of Water Affairs, or DWA), who constructed many concrete canal systems and networks that lead off the rivers and streams to increase the agricultural potential of the region. These canal networks were (and remain) predominantly gravity-fed systems and therefore flow 'down hill' toward their assigned outfalls. To facilitate in the correct functioning of these canal networks, numerous impoundment structures needed to be constructed along the rivers and streams to allow for a gain in height difference between the source of the canal and its end point. This has led to a relatively large amount of dam walls and weirs being located along the rivers of the region. Many artificial impoundments therefore exist that have augmented the aquatic habitat, but have also decreased viable riverine habitat. This had consequential impacts on the aquatic biodiversity within the Dinokeng region as riverine-dependent species are displaced by the transformation of river habitat (running, relatively shallow water) to dam habitat (still-standing and relatively deeper waters). Riverine species are driven upstream in an effort to source suitable habitat and, if habitat of suitable quality and quantity is not sourced, these species are eventually lost from the system.

According to the River Health Programme of the DWA, The overall status of the Upper Pienaars and Moreleta rivers is 'Poor'. The main contributors to this status stem from the highly urbanized and transformed land within the catchment. The smallholdings, chicken and dairy farming, along with illegal dumping of garden rubble and building rubble are problematic. Roodeplaat Dam has altered the upstream flow and bed conditions and also caused downstream sedimentation. Many indigenous fish species no longer occur due to urbanization and flows from sewage works. The poor water quality has also highly impacted the invertebrates associated with watercourses.

The overall EcoStatus for the lower Pienaars River is similarly 'Poor'. This is due to the Klipvoor Dam downstream, and outside of the Dinokeng area, where abstractions for agriculture has altered the natural flow pattern. Additionally, sedimentation is a problem due to overgrazing in the riparian area. Sand mining along the Boekenhoutspruit also increases the sedimentation. Alien species (mostly the bluegum and lantana species) are altering the riparian zone habitat, mostly in the upper reaches. Sensitive fish species have been lost as a result of urbanization and flows from sewage works, and eels are lost due to dams and obstructions in the rivers. Water quality is very poor and calls for urgent intervention. The Ecological Importance and Sensitivity is, however, 'Moderate' as there is still a diversity of species in the river system and degree of protection and refugia still exist.

The only data for the Olifants River system, of which the Elands River is a tributary, is for 2001 (Water Research Commission). The segment of river in the Dinokeng study area is the least impacted of the Elands River and its ecological condition deteriorates downstream of impoundments like the Rust-de-Winter dam. The classification of the Elands River itself is 'Poor to unacceptable', with only the stretch of the river above the Rust-de-Winter dam in a 'Fair' condition. The Rust-de-Winter dam has had a large impact on the condition of the river; flow releases from the dam are often insufficient and even non-existent. This has impacted the natural flow regime of the river and creates undesirable conditions for biological communities.

Wetlands

Wetlands are found throughout the study area. The wetlands in the central areas of Dinokeng are however subjected to high silt and chemical loads from surrounding agriculture and mining activities. These systems have therefore lost a large percentage of their contribution to the conservation of sensitive aquatic biota. Large impoundments within these areas have also had largely negative ecological impacts on aquatic fauna (especially fish) conservation within the region.

In contrast, the wetlands in the northern Dinokeng region are regarded as being in a better state of ecological integrity due to the low human habitation and land use impact of the immediate catchment area. There are however a large amount of instream barriers within these areas forming part of extensive irrigation infrastructure that has had largely negative ecological impacts on fish conservation within the area due to fragmentation of the aquatic habitat. Several wetlands have been destroyed or severely degraded within the DPA mainly through agricultural, mining and urban activities. Artificially created dams have flooded the seasonal wetlands especially the endorheic (closed basin) pans and valley bottoms. Cattle tend to trample sensitive hydrophilic vegetation as well as increase levels of turbidity and nutrients (eutrophication) which results in macrophytes or reed invasion.

The wetlands within the southern areas of the Dinokeng region can be categorised as typical urban-managed rivers and streams that are subjected to increased surface water runoff due to increased development within the area as well as bacterial and chemical contamination through failing or inadequate sewerage transport and processing systems. Many of the rivers within the southern areas are highly eroded due to increased flooding extremes due to the increased urbanisation within the immediate catchment, leading to systems that are also highly silted. Poor water quality, poor habitat quality, flooding extremes and inadequate riparian habitat mean that the river and stream systems within the southern areas support typically low aquatic species diversity.

All remaining wetlands (permanent and seasonal) and their associated indigenous grassland and sedge dominated surroundings must be considered as sensitive habitats. Indigenous marshland vegetation such as that found in the DPA comprises a habitat which is restricted in extent, highly productive and which contains a high diversity of plants and animals - many of which are restricted or heavily dependant on such habitats. The seasonal wetlands with their marshland or seepage vegetation (sedge and grass dominated) and the seasonal pools on valley bottom wetlands comprise the most important habitat within the study area for certain threatened species which may possibly occur, e.g. Giant Bullfrog, Rough-haired Golden Mole and the African Grass Owl.

Ridges

Ridges will be characterised by a particularly high biodiversity, and as such their protection will contribute significantly to the conservation of biodiversity in the area as well as the rest of Gauteng Province. For example, a wide variety of bird groups utilise ridges, koppies and hills for feeding, roosting and breeding. These groups include some owls, falcons, nightjars, swifts, swallows, martins, larks, chats, thrushes, cisticolas, pipits, shrikes, starlings, sunbirds, firefinches, waxbills, buntings, canaries, eagles and vultures. Ridges provide important habitats for sensitive species such as bats (roosting sites) and the eastern rock elephant shrew. Ridges and kloofs also contain caves, an important habitat for highly specialised animals like bats.

Diverse microclimatic conditions have resulted in a vast array of invertebrate communities associated with the high plant diversity characterising ridges. Hills and koppies generally have more insects (both in terms of individuals and species) than the immediate surroundings (Samways and Hatton, 2000).

Vegetation types

Three of the seven vegetation types represented within the DPA have a national conservation status of Endangered, namely **Marikana Thornveld**, **Springbokvlakte Thornveld** and **Rand Highveld Grassland**. While these vegetation types potentially comprise 36% of the surface area of the DPA, much of the area has been transformed or degraded through urban expansion, cropland agriculture and mining. The relative extent of the various vegetation types found in Dinokeng is indicated in Figure 5.

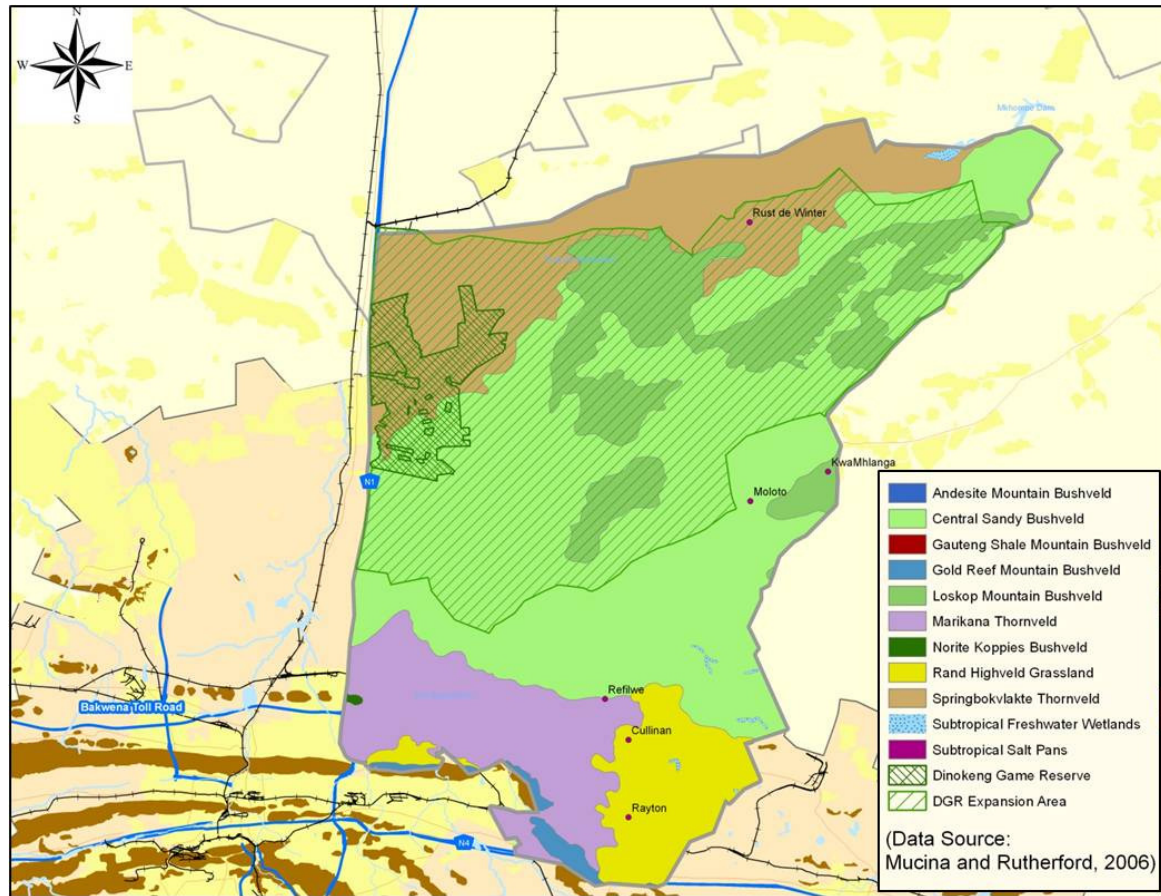


Figure 5: Vegetation types in Dinokeng

Marikana Thornveld is currently protected within the Roodeplaat Dam Nature Reserve, Buffelsdrift Conservancy and Seringveld Conservancy, while Springbokvlakte Thornveld is protected in parts of Rust-De-Winter Nature Reserve and Ditholo Nature Reserve (South African National Defence Force (SANDF) Air Force property). No provincial conservation areas exist within the DPA that protect Rand Highveld Grassland, although small areas of this vegetation type are contained within the Brandbach and Cullinan Conservancies.

3.2.1.2 Management objectives (desired state)

Biodiversity is the life blood of Dinokeng – both as the foundation of the tourism economy in the areas as well as in terms of the provision of critical environmental services. The conservation of biological diversity through the appropriate development and management of the various veld types, biomes and ecosystems present in the study area will ensure that ecosystem services remain functional. This will translate into habitable living space, clean and abundant water, natural consumable materials, fertile farming land and the like.

It is therefore necessary to have management and land use practices that ensure the conservation of sensitive areas, including current and future protected areas, irrespective of public/private ownership, along with the conservation and protection of water-related resources. Similarly, agricultural activities should ensure that no further degradation of sensitive habitats such as ridges, wetlands, grasslands and open bushveld habitats occur. Correct stocking levels should be implemented especially in the Rand Highveld Grassland vegetation unit to prevent overgrazing and habitat deterioration.

With the DGR as cornerstone, the Dinokeng Project focuses on the provision of an all-inclusive Big-5 game reserve experience. This product will however not be an attractive offer if the natural resource base is not taken care of. The objective is therefore to maintain a visually pleasing natural veld environment that has the necessary biodiversity to support a sizeable game reserve with large game species without outrageously intensive management practices.

There exists the potential to integrate conservancies into the larger tourism network for the DPA. The increase in land under conservation would be of a direct benefit to the conservancies as well as associated migratory animals. However, it would mean that management of the conservancies would have to become part of a broader management plan of area as a whole and the co-operative relationship between GDARD, the Dinokeng Project and the conservancy owners would have to be extended and reinforced. These enlarged areas could potentially form important conservation areas for several faunal species; including threatened (Red Data) faunal species. The existence and value of independent conservancies should however not be under-valued. It is however important to focus on what is actually happening within these conservancies that will assist the broader conservation effort.

The various constituents that make up the sensitive natural environments in the DPA, are spatially represented on **Annexure A: Map 1 - Status Quo Summary: Ecological Sensitivity**.

Watercourses

The riparian areas and their buffer strips in the Dinokeng Project area are under threat from habitat transformation resulting from current mining and agricultural activities, alien vegetation invasion (*Melia azadarach*, *Acacia mearnsii*) as well as wood harvesting and collecting.

An evaluation of the barriers to natural species migration along the various rivers and streams is therefore recommended to determine the necessity of them from a socio-economic perspective. It is recommended that those found to serve insignificant purposes be removed. The impoundment structures that serve a significant purpose should be provided with a fish bypass facility in the form of various fishway options. This is deemed a viable mitigatory option to facilitate and enhance general fish conservation within the Dinokeng area.

In general, the management of all watercourses should:

- Control development within the riparian zone;
- Improve the 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.

Comprehensive surface runoff and stormwater management plans indicating the management of all surface runoff generated as a result of development prior to entering any natural drainage system (i.e. stormwater and flood retention or attenuation ponds) will assist in managing the quality and quantity of surface water resources. These plans must be compiled for all developments, and must also consider the possible alteration of run-off rate, possible volume of debris and potential siltation problems.

Wetlands

Wetlands should be protected and rehabilitated where possible. The rehabilitation of degraded wetland habitats as well as improvement of water quality entering these systems should be implemented (Working for Wetlands, etc.). Farmers should be encouraged to fence off parts of the wetlands preventing further disturbances by livestock as well as providing habitat for wetland associated fauna, and no further dams should be permitted without appropriate studies proving their beneficial impact on the wetland. Rehabilitation should include the removal of weeds and invasive vegetation as well as introduced animal species (e.g. alien fish species from existing dams).

Vegetation types

The six vegetation types found in the DPA are worthy of conservation efforts for different reasons. Of the six, three classify as endangered on a national scale, two are considered sensitive due to the presence of endangered species, and the sixth is associated with aesthetically valued topography. From an ecological perspective, two determinants are used to prioritise the conservation of veld types:

- the presence of sensitive vegetation and species
- the level of current protection (as indicated by the inclusion of the vegetation within formally protected areas)

Consequently, the three key vegetation types that need to be afforded protection within the DPA are Gold Reef Mountain Bushveld, Central Sandy Bushveld and Rand Highveld Grassland.

- Gold Reef Mountain Bushveld (IUCN status as ‘Least Threatened’) is a key vegetation type for several highly threatened plant species and occur on the quartzite ridges along the southern border of the DPA;
- Central Sandy Bushveld (Vulnerable, and poorly protected) is relatively untransformed over large parts of the DPA and partly conserved on private and state land; and
- Rand Highveld Grassland, an endangered vegetation type, is currently highly transformed and does not receive formal protection within the project area, although small areas are conserved within the Brandbach and Cullinan Conservancies.

Two other vegetation types, while not apparently supporting many threatened plant species, have a national status of Endangered and are thus in urgent need of conservation:

- Springbokvlakte Thornveld is still represented by a number of significant untransformed areas of land within the DPA, particularly on the Ditholo Nature Reserve and the following farms: Boekenhoutkloof 87 JR, Haakdoornfontein 65 JR, Kliprand 76 JR, and De Witskraal 86 and 88 JR.
- Marikana Thornveld is protected within the DPA in Roodeplaat Dam Nature Reserve and the Buffelsdrift and Seringveld Conservancies. Potential key portions of land are: Buffelsdrift 281 JR, Roodeplaat 293 JR, Kameelfontein 297 JR, and Doornpoort 295 JR.

While urbanisation and the expansion of urban areas have had a relatively low impact within the DPA, they are a major cause of transformation within Marikana Thornveld and Springbokvlakte Thornveld outside of the DPA.

While the Nokeng tsa Taemane SDF limits urban development to the south-eastern part of the DPA, the expansion of the Cullinan/Refilwe urban areas could cause loss and degradation of patches of

untransformed Rand Highveld Grassland. However, this is less likely if urban development does not expand east of the Elands River.

3.2.1.3 *Legal and policy requirements*

Ridges policy

The guidelines which are applicable to the use and development of the different classes of ridges identified in the GDACE Development Guideline for Ridges are set out below.

Class 1 ridges (less than 5% development)

- The consolidation of properties on Class 1 ridges is supported.
- Further development activities and subdivisions will not be permitted on Class 1 ridges.
- Only low impact activities with an ecological footprint of 5% or less will be permitted in the 200 metre buffer zone of the ridge.

Class 2 ridges (5%-35% transformed)

- The consolidation of properties on Class 2 ridges is supported.
- The subdivision of property on Class 2 ridges will not be permitted.
- Development activities and uses that have a high environmental impact on a Class 2 ridge will not be permitted.
- Low impact development activities, such as tourism facilities, which comprise of an ecological footprint of 5% or less of the property may be permitted. (The ecological footprint includes all areas directly impacted on by a development activity, including all paved surfaces, landscaping, property access and service provision).
- Low impact development activities on a ridge will not be supported where it is feasible to undertake the development on a portion of the property abutting the ridge.

Class 3 ridges (35%-65% transformed)

- The consolidation of properties on Class 3 ridges is supported.
- The guidelines for Class 2 ridges will be applied to areas of the ridge that have not been significantly impacted on by human activity.
- The guidelines for Class 4 ridges will be applied to areas of the ridge that have been significantly impacted on by human activity.

Class 4 ridges

- The consolidation of properties on Class 4 ridges is supported.
- The subdivision of property on Class 4 ridges will not be permitted in areas of the ridge where the remaining contiguous extent of natural habitat is 4ha or more.

- Further development activities will not be permitted in areas of the Threatened and/or protected ecosystems ridge where the remaining contiguous extent of natural habitat is 4ha or more.

C-Plan

The erstwhile GDACE's Conservation Plan makes provision for ecological sensitivity modelling and subsequent classification which, although it does not prescribe any development controls, highlights specific sensitivities to inform development activities and control in terms of relevant legislation.

The conservation planning is based on ecological networks (migration corridors, ridges and watercourses), habitat units (pristine and/or critical undeveloped areas, wetlands) and locations of rare or endangered species. All areas designated as 'irreplaceable' in C-Plan must be kept undeveloped in order to achieve the conservation targets of the province (e.g. conservation of a particular species or habitat type). 'Important' sites are critical as a buffer zone around irreplaceable sites and as 'second best' option should some irreplaceable areas be lost to development.

EIA regulations

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. In terms of the EIA Regulations the applicant (and more specifically the Environmental Assessment Practitioner) have to give notice of the proposed application to any organ of state which has jurisdiction in respect of any aspect of the proposed activity; this could in some cases include the Dinokeng Project.

However, the Dinokeng Project should liaise with the relevant authorities to ensure that it is notified of any new EIA applications in or close to the Dinokeng area. It is important for the Dinokeng Project to be listed as an Interested and Affected Party in the context of EIA in the Dinokeng area. The Dinokeng Project should review EIA applications and comment on them. The legislation offers the opportunity for the Dinokeng Project to appeal a record of decision which it believes will impact negatively on the sustainable development of the Dinokeng area and Dinokeng Project.

NEM:BA

The National Environmental Management: Biodiversity Act provides for different legal instruments for the protection of declaration of a bioregion, listing of ecosystems, norms, standards, biodiversity management framework and biodiversity management plans. The following process is recommended for the Dinokeng Project Area:

- Declaration of the Dinokeng area as a Bioregion;
- Development of Biodiversity plan for the Dinokeng area;
- Implementation of a Biodiversity Agreement for the Dinokeng area; and
- In this perspective, the Dinokeng Project Team will have to liaise with the relevant authorities to investigate the possibility of implementing such measures for the Dinokeng Project Area.

NEM:BA also provides for control over restricted activities relating to listed threatened or protected species. Any restricted activity affecting listed species (including lion, elephant, leopard and rhino) must be permitted by the national department if the activity is conducted by a provincial authority on land under its own jurisdiction.

NEM:PAA

The National Environmental Management: Protected Areas Act provides for different legal instruments for the protection of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. The declaration of a nature reserve and/or the declaration of a protected environment could be the most suitable to protect the Dinokeng area and achieve the objectives of the Dinokeng project.

Water Act & Water Services Act

The general intention of the National Water Act is to manage and monitor water uses in order to ensure equitable access and a sustainable environment. The act makes provision for water uses that require permits, uses that are exempted through general authorisations, as well as the management of catchments, water uses and polluting activities. All relevant permitting must therefore be taken into account.

The Water Services Act, on the other hand, specifies the ways in which supply, management and disposal of water must be conducted. This is particularly relevant to the local authorities and any other water supply and treatment body.

In particular, the Water Services Act aims to protect each person's right to basic water supply and sanitation.

Department of Water Affairs

DWA specifies certain minimum requirements for water resource delineation and management. Specifically, the delineation of the riparian zone must be done according to "DWAF, 2005: A practical field procedure for the identification and delineation of Wetland and Riparian areas". A 100m buffer zone from the edge of the riparian zone for rivers/streams outside the urban edge and a 32m buffer zone from the edge of the riparian zone for rivers/streams within the urban edge must be protected from degradation or development. These requirements do not accommodate local sensitivities and context though.

Impact assessments of proposed developments must include an evaluation of the current hydrological regime and potential changes thereof, including the effect of that change on the downstream habitat and integrity of the system.

Weeds & Invasive Species Regulations

Regulations have been published in terms of the Conservation of Agricultural Resources Act (CARA)(Act 43 of 1983) that control the spread of weeds and invasive species. In terms of the regulations, identified species must be removed and/or its propagation controlled by land owners.

Conservation Ordinances

The Transvaal Nature Conservation Ordinance, 1983 (Ordinance 12 of 1983) specifies various measures and controls that apply to veld and game management practices in the province of Gauteng. These include measures for game reserve management, game and plant management and trade, fishery, etc. Further regulations have also been made in respect of the Ordinance to control the activities or specific issues or species relevant to the Ordinance.

Provincial Avifauna Policy

Table 3-1: GDARD Management Objectives (Desired State) for birds

<i>Species</i>	<i>Habitat and buffer requirements</i>
Blue Crane	400ha of contiguous suitable foraging habitat around Blue Crane breeding sites (usually in a wetland)
African Grass-Owl	100ha of suitable foraging habitat with a minimum terrestrial buffer of 170m from the edge of a wetland/stream
African Marsh-Harrier	Wetlands larger than 100ha that are identified as suitable habitat for this species must be buffered by 200m of terrestrial habitat.
White-backed Night-Heron	A buffer zone of 50m must be provided from the edge of the riparian zone
White-bellied Korhaan	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.
African Finfoot	A buffer zone of 50m must be provided from the edge of the riparian zone
Lesser Flamingo	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.
Greater Flamingo	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.
Black Stork	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.
Half-collared Kingfisher	A buffer zone of 50m must be provided from the edge of the riparian zone

Red Data Plants Policy

GDACE compiled a development guideline for sites where red listed flora are found. Accordingly, specific application, design and management measures apply, depending on the location of the site (inside/outside urban edge) and the species of concern. The policy also makes provision for appropriate buffer zones around known locations of red list plants.

3.2.1.4 Development parameters

As a general rule, no net loss of sensitive environments may occur. By implication, this rule applies to watercourses, wetlands, ridges and the remaining pristine vegetated areas of the most endangered veld types present in the study area.

The success of the DGR and broader Dinokeng Project will depend on the viability of the natural resource base for the envisaged nature-based tourism development framework. The Dinokeng area may therefore not degrade, lose or fragment its natural habitat and intact ecosystems beyond certain thresholds/tipping points. These occur where:

- Veld management interventions become financial burdens in excess of the overall project income opportunity;
- Service infrastructure investment exceed overall project income opportunity;
- The natural resource quality can not sustain the presence of Big-5 game species;

- Nature-based tourism loses its economic viability due to the unattractiveness of the resource;
- The quality of the veld and biome types present in the area fails to meet National and Provincial biodiversity conservation targets;
- Sensitive catchments must be protected; and
- River quality falls below recreational or potable water quality standards (as relevant).

Consequently, no further destruction of any wetland habitat within the DPA will be allowed, and similarly, agricultural activities should ensure no further degradation of sensitive habitats such as ridges, wetlands, grasslands and open bushveld habitats. Correct stocking levels should be implemented especially in the Rand Highveld Grassland vegetation unit to prevent overgrazing and habitat deterioration.

No further developments should be allowed within any Class 1 and 2 ridges within the DPA. Specialist studies must be completed for any further developments within a ridge system and describing the following:

- the ecological conditions – including the functional, hydrological and compositional aspects – of the ridge;
- flora and fauna – including any mammals, birds, reptiles, amphibians and invertebrates – that are present on the ridge;
- the impacts of the proposed activity on the flora and fauna as well as the ecological conditions;
- the stability of the slope and any implications thereof for the application; and
- the cultural, historical, open space and visual value aspects as well as the current use and value of the ridge for social purposes and the extent to which the proposed activity will impact on these uses or values.

Watercourse management requires specific management or intervention responses relative to the current state of, and pressures on the three main river systems present in the study area. These are:

Table 3-2: Specific management responses for river systems

<i>River System</i>	<i>Required Management Responses</i>
<i>Piensaars River/ Moreleta Spruit</i>	<ul style="list-style-type: none"> • Control development within the riparian zone • Improve the 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 • Identify pollution sources and enforce water quality standards
<i>Lower Piensaars</i>	<ul style="list-style-type: none"> • Clearing of alien vegetation • Management and control of overgrazing • Manage and enforce compliance of sand mining activities

<i>River System</i>	<i>Required Management Responses</i>
<i>Elands River</i>	<ul style="list-style-type: none"> • Clearing of alien vegetation • Water release management from Rust de Winter Dam, including determination of the ecological reserve and in-stream flow requirements
(River Health Programme, 2001 & 2006; Water Research Commission, 2001)	

3.2.2 Biodiversity sensitivities (*Specific Species*)

3.2.2.1 Current state

The Dinokeng Project Area is host to a variety of fauna and flora species of conservation concern. Most are associated with the general list of sensitive environments, such as watercourses and ridges, but may also occur in other areas.

There are currently eight (8) species of invertebrates that are threatened, rare and/or of conservation concern in Gauteng province. These include seven species of butterfly and one species of *cetonid* beetle. Of these eight species, three are well known to occur in the Dinokeng area.

Twenty-one Red List or Orange List³ plant species have been confirmed within the DPA.

In the absence of any avifauna or herpetofauna that are endemic to the province, nineteen threatened bird species, two threatened reptile species and 1 threatened amphibian species that are breeding residents, regular visitors or regular migrants to Gauteng (Tarboton, 1997) were prioritized for conservation attention in the province.

Numbers of bird species have declined in the DPA due to extensive habitat degradation and loss. Human activity has transformed grasslands in South Africa to a point where few pristine examples exist. Factors such as agricultural intensification, increased pasture management (overgrazing), decrease in grassland management and land-use alteration (urbanisation). Continuing developmental pressure on sensitive wetland and surrounding grassland habitats are largely responsible for the decline of the majority of bird species in Gauteng and the DPA.

Giant Bullfrog numbers are declining in Gauteng, North West, Limpopo and Mpumalanga provinces. The area of its habitat and population sizes had declined, particularly in regions subjected to extensive crop agriculture or urban and industrial development, such as Gauteng, Free State and North-West Provinces. Major road networks bisect suitable breeding and foraging areas, resulting in mass road fatalities of migrating adult and juvenile bullfrogs. Several road fatalities of adult Giant Bullfrogs were observed on the N1 adjacent to the western boundary of the DPA as well as adjacent to Moloto on the eastern boundary during the 2008/2009 wet season.

The Giant Bullfrog is, however, currently assigned as a Least Concern species globally (IUCN, 2009) despite the concern over its local rates of decline (on a local scale it qualifies as Near Threatened). Giant Bullfrogs have been recorded from the Dinokeng Quarter Degree Grid Squares and adjacent Grid Squares during previous surveys as well as during the South African Frog Atlas Project. Suitable seasonal wetland habitats exist for Giant Bullfrogs around the Buffelsdrift Conservancy, and several adult Giant Bullfrogs have been observed in the Moloto, Cullinan (Zonderwater) and Rayton areas. An

³ The designation 'Orange List' indicates that a particular species is headed towards a Red List classification in Gauteng in the near future.

adult male Giant Bullfrog 160mm in snout-vent-length was discovered at Kwalata Game Ranch to the north of Dinokeng; with a clutch of several hundred tadpoles measuring approximately 65mm.

Twenty-one Red List or Orange List plant species have been confirmed within the DPA. The GDACE Red Data plant policy considers endemism to be the most important criterion when conserving biodiversity (GDACE, 2001). Species endemic to Gauteng only are given highest priority (A1), followed by those endemic to Gauteng and one other province (A2), etc. According to this classification, three A1, nine A2 and five A3 endemics have been confirmed to occur, along with two Orange List species. The species, however, differ in their individual conservation statuses from Endangered to Least Concern.

The most important vegetation types for Red/Orange List plants are Gold Reef Mountain Bushveld (11 species), Central Sandy Bushveld (8 species) and Rand Highveld Grassland (7 species). The only vegetation types that provide habitat for A1 endemics are Gold Reef Mountain Bushveld (3 species) and Rand Highveld Grassland (1 species). A2 endemics occur within six of the vegetation types of the DPA, with Gold Reef Mountain Bushveld and Central Sandy Bushveld both supporting four of these species.

3.2.2.2 *Management objectives (desired state)*

- *General Fauna*

In setting conservation targets, the aim should be to prevent all priority threatened species from qualifying for a higher threat category in future. In order to achieve this within the context of Gauteng and the Dinokeng area, sufficient suitable habitat must be identified and appropriately managed to prevent further population declines and range reductions. For many species, improved management and mitigation of threats within transformed landscapes might well be sufficient to facilitate local population recoveries.

The open space system in the urban areas and surrounding farm lands in the Dinokeng project area must be developed to ensure that it incorporates all sensitive natural environments linked to each other through a continuous spatial system or biological corridors. Biological corridors allow for the flow of species (genes) over time between suitable habitats usually along rivers, drainage lines, ridges or mountains. It is imperative that future developments are excluded from these important areas. Ecological systems need to be linked in order to function properly and also to ensure sustainability of the original biodiversity.

- *Reptiles*

More comprehensive or updated reptile surveys should be conducted in the DPA. Indiscriminate killing of snake species during agricultural and urbanisation activities are likely to result in the disappearance of the larger and the more sluggish snake species within the project area. An educational programme should be implemented especially pertaining to Southern African Pythons.

- *Amphibians*

More intensive surveys are required throughout the entire DPA in order to establish the breeding localities as well as estimates of the current conservation status of Giant Bullfrogs as well as other frog species within the DPA.

- *Invertebrates*

Sensitive invertebrate habitat in the Dinokeng area can be regarded as any area harbouring a protected invertebrate species or, alternatively, any area that supports unique invertebrate diversity. The long term survival of sensitive invertebrate habitat, Red Data invertebrate species, populations, assemblages

or communities is therefore dependent on areas that support unique invertebrate habitat and includes rocky ridges, wetland systems or riparian zones.

Conservation of all wetland and riparian zones in the entire Dinokeng region along with sufficient buffer zones will ensure the long term survival of rare or endangered invertebrates specialized to live in aquatic conditions. Similarly, conservation of all undisturbed rocky ridges, particularly the eastern most Magaliesberg ridges that are located in the southern part of the region will ensure long term survival of all invertebrates that are specialized to live in rocky terrestrial habitat areas.

- *Flora*

The only possible desired state for floral species of particular sensitivity or concern is an improved conservation status. This will apply to the individual species in terms of the persistence of recorded specimens, the enlargement of discrete populations, as well as the conservation and rehabilitation of suitable habitat.

3.2.2.3 *Legal and policy requirements*

The regulatory requirements for individual sensitive fauna and flora species are similar to those listed under the listing for section 3.2.1 “Sensitive natural environments” above.

3.2.2.4 *Development parameters*

Generally speaking, open space areas can be divided into ‘core areas’, where untransformed sensitive habitat and rare or endangered species are present, and ‘buffer zones’ around the outside of the core areas. The buffers are required to prevent a progressive deterioration of the habitat value, ecological functioning and seeding function of the core areas. Open space areas must be individually evaluated in order to determine what constitutes the core area.

Different buffer requirements apply to various environmental states 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.

Additionally, mitigation measures 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, however, be exercised to prevent weeds and invasive species from replacing critical primary vegetation. ‘Re’vegetating 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.

A buffer zone of 1000m terrestrial habitat around suitable Giant Bullfrog breeding wetlands should be designated as sensitive and conserved and adequately managed. Fences and walls must be avoided or designed to not prevent the natural migration of adult and juveniles between and across foraging areas and suitable breeding sites (i.e. avoid habitat fragmentation). Habitat deterioration due to changes in the seasonality of wetland sites (damming or increased surface run-off), or deterioration of water quality due to pesticides and pollutants lead to the disappearance of bullfrog populations. Human predation of adult bullfrogs is another causal factor in population declines. This is especially prevalent in the rural parts of southern Africa (Limpopo as well as in Gauteng/ Hammanskraal). Bullfrogs are also caught illegally for the local and international pet industry. Continual destruction and deterioration of suitable breeding and foraging areas will result in the disappearance of Giant Bullfrog populations throughout southern Africa, especially on the Highveld in the Gauteng Province.

No further destruction of ridges and rocky outcrops should occur as these provide critical habitats for remaining rupicolous (found in rocky areas) reptile species including snakes, skinks and geckos. Termite mounds (especially moribund mounds) should be conserved wherever possible. If certain termite mounds have to be destroyed a rescue and recovery operation should ideally be implemented. Collected specimens should be rescued and relocated in suitable habitats away from development in the proposed DPA. Electric fences should place the live wires at least 20cm above the ground to prevent possible electrocution of pythons. Areas of suitable habitat (differentiate between breeding, foraging, aestivation, etc.) for each Red List species must be conserved, together with appropriate buffers and corridors. For example, 500ha of suitable foraging habitat around each confirmed locality of the Southern African Python must be conserved and adequately managed.

Two of the eleven known populations of the invertebrate *Ichnestoma stobbiai* are located in the Dinokeng region. One of these populations is located in the De Wagensdrift sub-region on the Farm Hartbeesfontein approximately 14km east of Temba (S25 24 40.8 E28 24 19.9). The second population is located in the Rust-de-Winter sub-region near to the Elands River in-between Buffelsdrift and Rust-de-Winter (S25 11 54.0 E28 34 32.0). It is imperative that these populations are protected as *Ichnestoma stobbiai* remains one of the most threatened animals in Gauteng Province. It is, however, highly unlikely these are the only two populations of *Ichnestoma stobbiai* in the Dinokeng region. Concentrated efforts by GDACE and the Scarab Research Group of the University of Pretoria revealed five new populations of this species in Gauteng in 2006 and 2007. Similar efforts in the Dinokeng region are likely to reveal more populations of this very specialised beetle. Until such an effort is made, no comprehensive invertebrate sensitivity map can be compiled for the Dinokeng region.

To ensure conservation of sensitive areas, including current and future protected areas, irrespective of public/private ownership, along with the conservation and protection of water-related resources, the following is proposed:

- River quality may not fall below ecologically functional water quality standards;
- Weeds and invasive plant control must maintain, but preferably improve, the status quo of infestations;
- Prevent all priority threatened species from qualifying for a higher threat category in future;
- In short, no net loss of sensitive environments may occur (rocky ridges, wetland systems or riparian zones);
- The status quo of all sensitive habitats and threatened species populations must be improved;
- Protect the identified populations of *Ichnestoma stobbiai* with sufficient buffers and veld management; and
- Application of provincial or local conservation strategies.

Systematic and representative wetland monitoring programmes need to be implemented on the wetlands within the DPA. Such monitoring programmes need to be pro-active and identify the current impacts and potential threats from future developments. Research needs to assess the health and functioning of wetlands at a catchment scale and establish a link between rehabilitation and sustainable livelihoods.

All suitable habitats for terrestrial Red List mammal species recorded or potentially occurring within the DPA should be conserved and designated as sensitive. All caves, including a 500m buffer zone, must be designated as sensitive.

The removal of the majority of natural rock in the agricultural lands severely restricts refuge habitat for the majority of reptile species. The frequent burning of the vegetation in the project area will consequently have a high impact on remaining reptiles by actual burning as well as increased predation levels. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early summer months destroy the emerging reptiles as well as refuge areas, increasing predation risks. Illegal reptile collecting is also a factor which should be considered especially pertaining to juvenile African Rock Pythons which are highly sought after for the local and international pet trade. Termite mounds are also harvested for the feeding of wild or aviary birds.

Where red list flora is found, or known to occur, the requirements and recommendations of the GDACE Red Data Plant Policy for Environmental Impact Evaluations must be adhered to. Implementation can, however, be adjusted based on scientific motivation that indicate how the conservation status of the species of concern will be improved.

The conservation of biological diversity through the appropriate development and management of the various veld types, biomes and ecosystems present in the study area will ensure faunal diversity and functional ecosystem services within the DPA. These provide critical faunal habitats, habitable living space, clean and abundant water, natural consumable materials, fertile farming land and the like. By implication, the Dinokeng area may not degrade, lose or fragment its natural habitat and intact ecosystems beyond certain thresholds. These include those specified under the more general “Sensitive Natural Environments” section previously, and some that are more specific:

- The potential failure to meet provincial/national conservation targets may result in the loss of intrinsic value of biodiversity and loss of ecosystem functioning resulting in local extinction of species and global/national extinction of endemic species;
- Veld management interventions become financial burdens in excess of the overall project income opportunity;
- The natural resource quality can not sustain the presence of Big-5 game species;
- Nature-based tourism loses its economic viability due to the unattractiveness of the resource;
- The degradation of ecosystems leads to the loss of landscape quality/amenity;
- River quality falls below recreational or potable (DWA) water quality standards;
- The degradation and loss of wetlands may result in degradation of water resources and water quality – there may be a consequent increased prevalence of human diseases, and the loss of biodiversity and ecosystem processes associated with these wetlands;
- There may be a decrease in productivity (economic) and long-term sustainability due to overexploitation of natural resources and degradation of natural environments;

The following indicators are proposed for future monitoring of fauna & flora:

- Population trends of selected threatened species such as *Python natalense*, *Tyto capense*, *Pyxicephalus adspersus* need to be monitored so that changes in threatened status can be detected;
- Extent of alien invasion in DPA - i.e. a map showing spread of aggressive alien invasive species. A potential indicator could be percentage of DPA invaded by alien species; and

- The percentage of provincial targets met for conservation of threatened species, vegetation types, ridges and wetlands. This monitoring will be conducted in conjunction with GDARD's systematic conservation planning efforts. As a general rule, no net loss of sensitive environments may occur.

3.2.3 *High potential agricultural areas*

3.2.3.1 *Current state*

The majority of agricultural activities and cultivated lands are situated in close proximity to the major watercourses namely the Hartebeestspuit, Pienaars River, Edendalespruit, Premiermynloop, Rooispruit and Krokodilspruit (refer to **Annexure A: Map 3 - Status Quo Summary: Development**). Production methods consist of both dryland and irrigation farming. The latter is present as both 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 also found within the study area.

The Dinokeng area lies on the broad boundary zone between highveld and bushveld, and the grazing capacity (measured in hectares required for one large stock unit or 'lsu') decreases northwards, from around 7-8 ha/lsu in the south to around 11-12 ha/lsu in the north (ARC-ISCW, 2004). This classification however does not apply to game farming, where more detailed specialized knowledge is required, mainly in terms of relating plant species composition in both the grass layer and woody layer to the requirements of various grazing and/or browsing species of game.

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.

The only land type where there is a predominance of high potential soils (>80% of the land type) is **Ae20**, occurring in the north of Dinokeng, where deep, red, friable loamy soils are found. The other areas with significant occurrences of high potential soils (between 40-45% of the land type), occur in the south, namely land types **Ba12, Ba13, Bb16** and **Bb17**. Virtually every other land type will contain smaller areas of high potential soils, but these will usually be scattered rather than contiguous zones or blocks. 'Good Soils' are defined as those that can sustainably be used for a wide variety of purposes, with little or no danger of degradation (e.g. erosion). Ideally, they should be medium-textured (10-30% clay), not have a strong structure, and be well-drained, with at least 750 mm depth to any restricting layer.

Areas that were under cultivation, as recorded by the National Land-Cover Database, are concentrated in the south (especially south-east) and far north of Dinokeng and correspond more or less with the higher potential land types as identified above.

GDARD has demarcated a number of agricultural hubs throughout the province as part of the Gauteng Agricultural Potential Atlas (GAPA 3). These hubs relate 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 (Figure 6). This agricultural hub forms part of the Elandshoek, Cullinan, De Wagendrift and Kameelfontein/ Wallmansthal subregions.

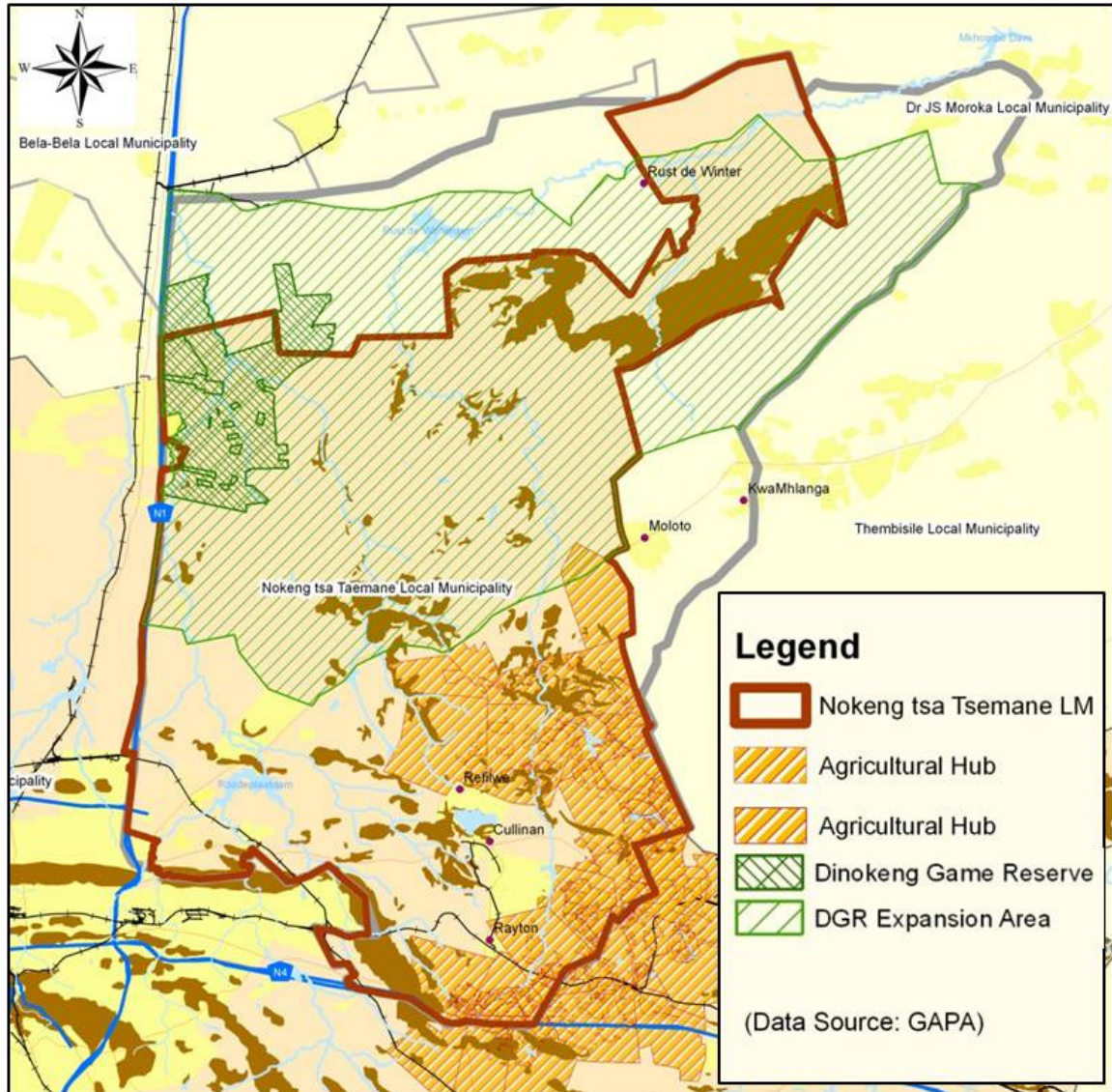


Figure 6: Location of the Agricultural Hub

3.2.3.2 *Management objectives (desired state)*

The Nokeng/Kungwini Agricultural Hub is identified in the eastern part of the DPA. The purpose of the agricultural hub is to conserve land that has high potential for agricultural development and discourage urban development and other incompatible land uses within the defined area. It is clear that from a provincial perspective there is a strong focus on agricultural development in the region, specifically as an economic sector.

The Metsweding Spatial Development Framework has demarcated a substantial part of the municipal area as a District Open Space System with the aim of protecting the conservation resources that exist in the district and to protect the valuable agricultural land that is found in the district for future generations.

Due to the relative scarcity of large areas of high potential agricultural land in Dinokeng, 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 Dinokeng, as well as in the broader aspect. 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.

The general focus of the DGR and Dinokeng Project as a whole will, however, be on game farming. The intention is to have a large enclosed game area comprising of private and state land, which can be managed as an unfragmented entity. Any high potential agricultural areas falling within the DGR will therefore have less priority than game farming or tourism related uses. That does not preclude the persistence of island farms though, but normal farming activities will need to co-exist with adjacent game areas.

3.2.3.3 Legal and policy requirements

Both NEMA and the CARA require of landowners to obtain 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.

NEMA

The development of agricultural or undeveloped land, either in general (of a certain size) or specific (certain defined developments), usually require environmental impact assessment authorisation under the NEMA EIA Regulations.

CARA

The regulatory scheme of the Act involves control measures that relate to the utilisation and protection of land that is cultivated, utilisation and protection of vegetation and the protection of water resources against pollution on account of farming practices. Several control measures have been published.

GAPA 3

The GDARD has done an analysis of agricultural resources in the province, and identified the larger contiguous areas of high potential agricultural lands as either Important Agricultural Sites or as Agricultural Hubs depending on the size, viability and location (access to markets etc.). Seven hubs were identified in Gauteng, of which one falls within the study area. Land development inside an agricultural hub must be supportive of the agricultural focus, and not sterilise or fragment viable intact areas of agricultural land.

Subdivision of Agricultural Land Act (Act 70 of 1970)

This Act has been 'repealed' by the Sub-division of Agricultural Land Act Repeal Act (No 64 of 1998), but this will only become effective from a date yet to be published. The existing legislation is therefore still applicable and primarily provides for the control of sub-division and use of land deemed to be agricultural land. According to a Constitutional Court ruling on the applicability of the Act, the National Department of Agriculture must approve the division of land portions that were not part of municipal areas prior to the demarcation of wall-to-wall municipalities in 1994.

3.2.3.4 Development parameters

Agriculture, both in food production and game farming forms, represents one of the core components of the envisaged Dinokeng Project Area's economic base. It relates directly to the tourism and conservation management, as well as socio-economic development and therefore needs to be managed, allocated, accommodated and supported in conjunction with these three factors. 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 as these provide both an income and employment for a significant proportion of the population.

Specifically, the Nokeng/Kungwini Agricultural Hub and high potential agricultural areas outside the DGR area must be mapped and managed as food production priority areas, whereas the DGR management will ignore high potential land to a great extent.

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.

3.2.4 Cultural-historic heritage

3.2.4.1 Current state

The locations of tourism and heritage resources are indicated on **Annexure A: Map 2 - Status Quo Summary: Conservation, tourism and heritage.**

The DPA area is considered to have a high tourism potential comprising natural, cultural and historical resources. The attractiveness of the area is that it contains a rich natural and cultural diversity attached to the Magaliesberg and rocky outcrops in the study area. Dinokeng's cultural and historical heritage includes Iron and Stone Age sites, relics of colonial diamond mining activities and Anglo-Boer War and World War II sites, as well as its history of black oppression and forced removal. To pro-actively utilise and develop the Dinokeng Cultural Heritage Resources will to a large extent depend on how resources are identified, developed and utilised.

The cultural heritage of Dinokeng spans a period of more than a million years. It covers the entire cultural development of people from Stone Age until today. It includes pre-historic African history, colonial conquest and more recent historical events. It therefore depicts the interaction between the first humans and their adaptation and utilization to the environment, the migration of people, new technologies, warfare and the struggle for survival, as well as evidence of ethnic and racial conflict but also of living and working together. The record also covers a depiction of the conquering of black people by whites, British imperialism and the struggle for freedom connected to the rise and fall of apartheid; incorporating the struggle for land, forced removals and unequal economic development. Finally, it ends with the development of mining, migrant workers and the finding of the world's largest diamond.

3.2.4.2 Management objectives (desired state)

As the study has shown, the potential for heritage tourism is great in the Dinokeng area, but identification and documentation of the legacy in the area are prerequisites for the preservation and/or utilisation of the resources. This is especially true for oral histories, which disappear with each old person being laid to rest. There is, however, no reason why the Dinokeng project cannot set an example for the rest of Africa to follow.

It has to be emphasized that to create a unique African experience, in line with Marketing and Tourism proposals, it is necessary to follow an African integrated approach where nature is culture. In this model both natural and cultural resources are one and equal in significance, conservation status, utilization and edutainment.

Only if this model is pursued, will it be possible to create something unique and of national importance. A visit to Dinokeng should be an experience which only Dinokeng can offer. This experience should not follow existing practice as found all over southern and eastern Africa where tourists visits game parks and only see and experience the natural heritage of Africa. Africa has far more to offer than big game and open spaces. Africa has the longest cultural history in the world. It is the Cradle of Humankind and can offer a glimpse into more than a million years of human cultural

development and practice where people adapted to the environment and fine-tuned the utilization of its natural resources.

To pro-actively develop the Dinokeng cultural heritage resources into regional, provincial or even national important resources, will to a large extent depend on how these resources are identified, developed and utilized in a sustainable way. Eventually this will determine the uniqueness and quality of the experience that these resources will offer to inhabitants as well as tourists.

3.2.4.3 *Legal and policy requirements*

NHRA

The National Heritage Resources Act makes provision for relevant levels of protection of heritage resources (national estate, declaration of heritage sites, declaration of protected area, declaration of heritage area). It will be necessary, however, for the applicable Management Authority to submit a nomination of places in the Dinokeng area to be declared national or provincial heritage sites to the relevant Heritage Resources Agency.

Generally speaking though, various artefacts or elements of the social and natural environment are regarded as heritage resources and are protected by the Heritage Act. Permits are therefore required before they may be disturbed unless the control is duplicated by other regulatory processes. These include:

- structures older than 60 years;
- archaeological and paleontological sites and material, and meteorites;
- graves of victims of conflict and graves older than 60 years;
- public monuments and memorials; as well as
- any heritage objects as declared by the South African Heritage Resources Agency (SAHRA) from time to time.

In addition, the following activities require authorisation from the relevant Heritage Resources Agency unless the provisions of other legislation cover the same activities:

- The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- The construction of a bridge or similar structure exceeding 50 m in length;
- Any development or other activity which will change the character of a site:
 - Exceeding 5 000 m² in extent;
 - Involving three or more existing erven or subdivisions thereof; or
 - Involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- The re-zoning of a site exceeding 10 000 m² in extent; or

- 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.

3.2.4.4 *Development parameters*

All activities in the study area must conform to the parameters laid down by the Heritage Resources Act, including any tourism development that will use heritage resources as (part of) a product offering. Important heritage resources need to be protected formally.

Ideally, all heritage sites should be recorded and at least briefly investigated. SAHRA must be involved wherever development is likely to affect heritage artefacts, sites or bodies of knowledge. Any works affecting heritage must be recorded and the details of the heritage features documented appropriately for future reference. Tourism development should take heritage resources into account as part of the regional offering and tourism product.

3.2.5 *Development Planning*

3.2.5.1 *Current state*

The DPA comprises two main towns, namely Cullinan (includes the township Refilwe) and Rayton (includes the township Phumzile) which are situated in the southern part of the DPA (Figure 7). These are the main service centres within the rural area of the Nokeng tsa Taemane municipal area. Although extensive urbanisation has already taken place in the Roodeplaats Dam area closer to Pretoria, these two areas remain the most important urban nodes within the municipal area. The adjacent and surrounding farms vary from relatively smaller subdivisions in the southern part of the study area close to the N4 National Road to larger farms/portions in the northern parts with extensive agricultural activities. Many commercial or business related activities occur adjacent to the main roads.

Four spatial development frameworks or development plans exist that manage development and land use in the Dinokeng area, namely –

- Dinokeng Integrated Tourism Development Framework, 2001, in particular Volume C: Land Use, Environmental Management and Infrastructure Development Framework, which was commissioned by Gauteng Provincial Government;
- The Metsweding District Municipality's Spatial Development Framework;
- The Nokeng tsa Taemane Local Municipality's Urban Areas Spatial Development Framework; and
- The Nokeng tsa Taemane Local Municipality's Rural Areas Spatial Development Framework⁴.

The fact that there are different spatial development frameworks for the area is detrimental to the successful implementation and management of the Dinokeng project, as the various plans do not result in a seamless integration of spatial planning. As such, the current situation is that the Nokeng tsa Taemane spatial development frameworks are not aligned with the Dinokeng land use framework and

⁴ The 2008/2009 revision of the Nokeng tsa Taemane SDF incorporates the two Nokeng spatial frameworks into one document.

there exist areas of conflict between provincial and local development proposals for the area, each vigorously defended by their proponents.

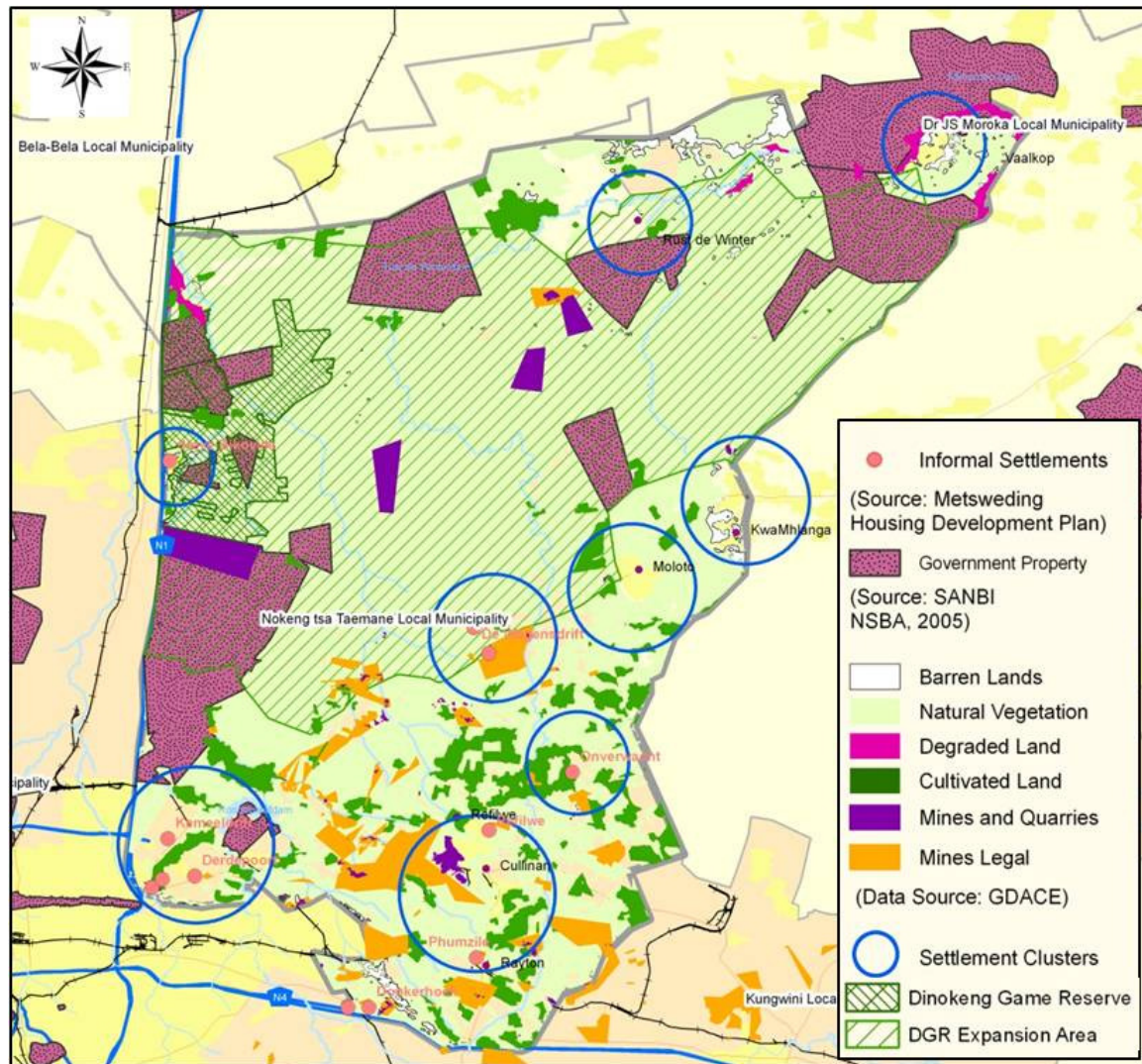


Figure 7: Land use in Dinokeng

One of the key characteristics of the Dinokeng study area is the fact that it comprises a large number of natural features such as dams, rivers and mountains/ ridges, which lends itself to the creation of an eco-tourism economic intervention such as the Dinokeng Game Reserve. These natural features also play a strong role in spatial development, as they act as natural structuring elements. The relationship between these features can be seen on the maps generated as part of the Status Quo Report phase of this EMF study.

Generally speaking, the Dinokeng area can be characterised as thus:

- The DGR in the North and conservancies in the central parts;
- Mixed uses, with some light industrial activities immediately next to the Zambesi/N1 interchange;
- Recreation and residential (smallholdings and exclusive estates) use around Roodeplaat Dam;

- Mining and urban clustering around Rayton, Cullinan & Refilwe;
- Heritage tourism uses around Cullinan;
- Military lands along the N1;
- Extensive sand mining areas between Roodeplaat Dam and Cullinan;
- Marginalised residential areas around Hammanskraal, Moloto, Vaalbank and Rust-de-Winter;
- Extensive farming areas in the central and North-Eastern portions;
- Access to the area from the N1 highway, primarily at the Zambesi and Hammanskraal interchanges, with the central Moloto Road, Derdepoort/Cullinan Road and Doornpoort/Mamelodi railway line traversing the area; and
- Natural structuring elements in-between.

According to the IDP (2008/2009) there are ten (10) informal settlements within the Nokeng tsa Taemane LM that require intervention. These are:

Table 3-3: Informal Settlements in Nokeng Tsa Taemane

<i>Settlement name</i>	<i>Relocation property</i>
Plot 123 Leeuwfontein 299 JR	
Plot 174-175 Kameeldrift 298 JR	Plot 174 and 175 Kameeldrift 298 JR (17 Hectares)
Steve Bikoville	
Plot 78 Dewagensdrift	Plot 79 Dewagensdrift 417JR (21,4 hectares)
Donkerhoek	Remainder of Portion 45 Pienaarspoort 339-JR
Rust de Winter	
Onverwacht-Ellison Steinberg	
Refilwe Hostels and Refilwe Informal Settlements	Plot 80 Oog van Boekenhoutskloof Alias Tweefontein 288 JR (75 Hectares)
Phumzile	Plot 137 Elandshoek 337 JR

Large scale development in the City of Tshwane bordering Dinokeng is evident along the Zambesi road towards the east, spreading into the Nokeng tsa Taemane area. Growth in the north of the City is probably most profound, as this is a critical point of entry into the Province and the City. The City is also growing eastward, as Mamelodi is an area of choice for those who want to be closer to their work in the eastern parts of Tshwane (Silverton, Menlyn).

The City of Tshwane and the municipalities on its borders experience population growth in areas close to economic activity, mainly along major routes. In an attempt to be close to economic activities, growth in settlements along the N1 and growth of informal settlements on the periphery of City of Tshwane occur and is expected to continue. Settlements removed from economic activities are also growing, and it is likely that these inhabitants will not escape the poverty cycle.

There are residential estate developments occurring within the area classified as Roodeplaat Nature Reserve. These developments were approved by the municipality and province for formalisation of land parcels around the dam.

The major areas where development planning for the Dinokeng area differs between the provincial and local authorities are -

- There is a lack of shared agreement between the Provincial Government and Nokeng tsa Taemane Local Municipality as to the boundaries of the Dinokeng project area and the nature of development to be permitted. In part, however, this ‘disagreement’ stems from the fact that the municipality historically viewed only the Dinokeng Game Reserve (north of the Moloto Road) as being the Dinokeng Project when, in fact, the project covers the entire municipal area;
- The local authority and provincial government have different views on the nature and extent of urban development to the south of the Roodeplaata Dam and the railway line. The district and local municipalities have recognised the area to the south of the railway line as an urban development area, and have included it as such in the respective spatial development frameworks. The provincial government on the other hand looks to restrict development in this area through its exclusion from the provincial Urban Edge;
- The proposal of the local municipality to allow urban development along Cullinan Road (R513) between Roodeplaata Dam and Cullinan as part of a new proposed consolidated spatial development framework for the southern part of Nokeng tsa Taemane is in conflict with the DITDF, and will need to be jointly resolved between the two parties concerned; and
- The standards and parameters for the subdivisions of farm portions throughout the Dinokeng project area differ between the various development frameworks. Generally speaking, the municipality allows for smaller subdivisions than that proposed by the DITDF.

3.2.5.2 Management objectives (desired state)

The entire area covered by the Dinokeng Project should comprise a single ruling spatial development framework that is jointly owned by the provincial, district and local authorities. This framework must be approved by the local authority and as such have legal standing as part of the municipality’s integrated development plan.

Until such time as a single framework exists for the entire Dinokeng area, the efficient and sustainable management of the area from a development perspective will be compromised. This spatial development framework should-

- Look at the inherent development potential of particular areas for economic and residential development and make appropriate development proposals for those areas, in line with the principles of the National Spatial Development Perspective;
- Find an appropriate development solution for the area to the south of Roodeplaata Dam, taking into consideration the local as well as regional context of the area, both from an environmental and economic development point of view;
- Develop standards and parameters for subdivisions in the rural environment;
- View development in its larger context; and
- Look at existing rural settlements and how those should be dealt with to provide rural housing opportunities.

Fragmented zones and urban sprawl should not be created or encouraged. By implication, incompatible land uses must be identified timeously, and appropriate decisions or solutions identified.

The development of more housing estates, housing for different socio-economic classes, accommodation and facilities should be assessed in the broader context of the project. The success of

the project will be at risk when a smooth, integrated spatial development is not achieved and habitat and natural resources are inadequately protected to sustain the intrinsic characteristics of the area.

The construction and operation of accommodation, visitor centres, infrastructure, and other services has a direct impact on the environment, e.g. vegetation removal, animal disturbance, elimination of habitats, impacts on drainage, pollution etc., and the sense of place of the area. The number of visitors allowed in the reserve should be determined and should inform the spatial framework. These numbers should be such that a balance is created between the economic, natural and social environment.

It is generally proposed that the majority of future residential and economic development in the region be promoted along the Moloto route. The intention is that the Moloto route should serve as a local activity spine to Thembisile. At a more detailed level the bulk of growth and development initiatives should also be focused towards the western portion of the Moloto route, which includes the settlements of Moloto, KwaMhlanga, Enkeldoornoog, Vlaklaagte and Tweefontein. The census figures indicate that there is a trend for settlement to concentrate in this area rather than further towards the east. The main reason for this is the fact that this is the part of Thembisile nearest to the economic activities of Gauteng Province (Thembisile IDP, 2007/2008).

On a local planning level, urban development west of Rayton towards Roodeplaats is encouraged, whilst further development east of Rayton, Zonderwater Prison and north of Refilwe is discouraged. Development along the transportation links between Rayton and Cullinan appears inevitable. The issue of development to the south of the Roodeplaats Dam can be turned into an opportunity if it is dealt with correctly. There is a need within the hierarchy and typology of residential opportunities permitted and provided for in an urban area to also make provision for low density, estate type living for people who want to be closer to a rural environment but yet have functional linkages with the urban environment. These developments typically take place on the periphery of the urban areas, close to the rural areas, as is the case with the location to the south of the railway line. Having a permanent residential population on the doorstep of the Roodeplaats recreational area could be beneficial for the Hub from an initial viability and economic sustainability perspective. Specific water resource-related developments, along with recreational facilities around the dam could only benefit from a regular customer base. However, what is important is to retain the environmental integrity of the dam itself and not permit any development to the north of the railway line, to only permit very low density developments to the south of the railway line, and to have detailed planning and design framework for the area that protect aspects such as visual corridors, vistas, gateways etc.

Refilwe is considered to be an area that has tremendous potential for so-called township tourism. There is already a proposal to redevelop the main access route into Refilwe as a vibrant activity street with a strong focus on tourism. Investment is however required to kick-start this development.

The northern and eastern parts of Nokeng tsa Taemane Local Municipality are reserved for agriculture, and non residential uses in these areas should be limited to tourism, eco tourism and agriculturally oriented uses. Agricultural activities within the DGR will cease once the reserve is fully functional.

The focus on the provision of housing should not only be on quantitative housing delivery but also on housing development that facilitates a sustainable livelihood for occupants within particular localities. Future housing delivery and development should take place within the vicinity of social facilities and economic opportunities to make it easier for the community to obtain the services and access employment opportunities.

When all the proposed new townships have been completed and taken up, the number of households in the municipality area may double in the next five to ten years. Apart from the urban expansion in the Roodeplaats area, housing developments for the next 10 years will centre on the 3 primary urban nodes of Rayton, Refilwe and Cullinan, as well as Onverwacht Settlement:

- Low income housing (with efficient basic service delivery) for Refilwe Township (1607 houses);
- Middle to higher income housing for Rayton and Cullinan (761 houses). Recent trends indicate the need for housing in Rayton could grow even more as it is an increasingly popular area for those working in Tshwane; and
- 79 houses for Onverwacht.

There must be a match between where people are located and where economic activities are taking place. Opportunities are created locally through the informal and small business sectors, which do not require high education and training levels. An increase in the local population will result in an increase in the local economy and productivity increases, which in turn creates job opportunities as the demand for certain services increase. By implication, the Spatial Development Frameworks of municipalities should reflect this in a co-ordinated manner, and be adhered to. Infill development should be the focus, whilst the urban edge concept is used to determine and manage urban sprawl.

The necessary support must be put in place to manage an increase in income generation through rates and taxes and to execute and financially manage maintenance.

Developments must be controlled in a manner that does not detract from the chosen sense of place, as this will assist in increasing tourist numbers to the area. The development of Cullinan and other tourism areas must similarly take place within the broader context of Dinokeng.

Lastly, all land tenure problems must be solved in order to ensure security of tenure and to unlock the value of developable land.

3.2.5.3 *Subdivision*

The subdivision of farm portions will have to be standardised into a single subdivision policy for the area, which is approved by the local municipality and hence will have the necessary statutory powers. A common understanding of what is feasible from an agricultural as well as conservation point of view needs to be achieved and agreed on since it is clear that there is a discrepancy between what the local authority is prepared to approve and the minimum standards set by the Dinokeng Framework. The local municipality is, for example, prepared to support subdivisions up to 20 hectares in the northern part, whereas the Dinokeng Integrated Tourism Development Framework proposes a minimum of 50 and 100 hectares in the two northern sub-regions.

Smaller subdivisions such as one and two hectares 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, the exact parameters of which should be agreed on between provincial management authority and the local government.

Subdivision of properties has the potential to unlock economic development and potential, but only if the local service infrastructure can accommodate the resultant densification, and the benefits of new investment can be retained in the local economy. Creating low-cost properties for commuters from urban centres, for example, is not an economically sustainable solution as the excessive commuting places additional strains on the local roads infrastructure, without commensurate compensation in the form of local cash spending and rates collection.

The Local Authority(ies) therefore needs to do a strategic assessment of the subdivision policy, in order to determine where and how subdivision should be allowed, based on the recommendations of this study. The findings must be reflected in the SDF. The size and structures of sub divisions must be determined according to land use planning standards and the level of municipal services that can be

delivered. In respect of all developments, subdivisions included, appropriate standards of engineering services must be adhered to.

3.2.5.4 *Legal and policy requirements*

General legislative framework

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 Dinokeng, are –

- The principles of the Development Facilitation Act, 1995 (Act 67 of 1995);
- National Environmental Management Act, 1998 (Act 107 of 1998);
- Gauteng Planning and Development Act, 2000 (Act 3 of 2000);
- National Spatial Development Perspective; and
- White Paper on Spatial Planning and Land Use Management, 2001

In terms of legislation, municipal planning is a function of the local municipality. The agreement and cooperation between the local municipality and provincial government insofar as jurisdiction and management is concerned is one of the issues that need to be resolved in order for Dinokeng to be a success.

Planning and policy principles that should be applied are 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 with land development in rural and urban areas in support of each other;
- 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; and
- Environmentally sustainable land development practices and processes must be encouraged.

DFA

The Development Facilitation Act contains numerous provisions relating to environmental issues and protection. The Act is underpinned by a set of “general principles for land development and conflict resolution” that apply to all authorities and act as guides to the administration of all land use plans and guidelines for authorities in the carrying out of their administrative land development functions.

The principles *inter alia* states that all land development policy, administrative practice and law should promote both efficient and integrated land development in that they encourage environmentally sustainable land development practices and processes as well as sustainable land development at the required scale. Sustainable protection of the environment should be promoted.

Local Spatial Planning

The Local Government: Municipal Systems Act (Act 32 of 2000) requires of municipalities to compile and maintain Integrated Development Plans and Spatial Development Frameworks. In the Dinokeng area, Local Spatial Development Frameworks exist for Roodeplaat as well as the Cullinan/ Rayton area. On top of that, Metsweding has its own SDF which can be considered a regional SDF. These outline the general spatial planning for the study areas, and the relationship between municipal infrastructure, land uses and future expansion areas.

The Municipal Systems Act and related approved planning documents place obligations on the relevant municipalities in terms of commitments to service delivery and infrastructure development.

The most pressing issues that emerge from the comparison of the DITDF with these planning frameworks are:

- Common understanding and agreement on the boundary of the Dinokeng project area and the nature of development to be permitted needs to be established. As a result of confusion between the definitions of the DGR and Dinokeng Project, the Nokeng tsa Taemane Local Municipality considers the Dinokeng project area to cover the area to the north of the Moloto Road, while the Gauteng Provincial Government has included the whole of Nokeng tsa Taemane;
- Pressure for proposed urban development to the south of the Roodeplaat Dam and the railway line is perhaps the greatest area of challenge in terms of land use planning and development. Both the Metsweding District Spatial Development Framework and the Nokeng tsa Taemane Rural Areas Spatial Development Framework have indicated this area as an urban development area but it is excluded from the Gauteng Urban Edge. This impacts on the proposals made by the Metsweding Municipal Housing Development Plan, which have proposed settlement development in this area. This area is generally seen to be an extension of both the Zambesi and Platinum Development Corridors in the adjoining Tshwane municipal area, and the urban development is an extension of the developments to the east of the N1;
- Smaller areas of contradiction, which can readily be solved through discussion and joint decision, are the boundaries of the various development nodes, the standards for subdivision of farm portions, the location of rural service centres and the nature of land uses permitted in the rural areas.

The developments around Cullinan and Rayton are logical expansions of the original towns, and it is desirable for growth to occur in these areas to prevent stagnation and decline. However, in terms of the Gauteng Spatial Development Framework, 2001, these towns should not extend into the rural areas. Conflict arises on this matter though, as the urban development boundaries demarcated by the provincial planning (Gauteng Urban Edge) and the Nokeng tsa Taemane Urban Areas Spatial Development Framework differ. What is required is that both planning frameworks be revisited in

consideration of the environmental sensitivities and objectives identified in this study. An agreement on development boundaries that is informed by both environmental principles (refer to section 5.3 later in this report) and development planning, is possible and desirable. As long as these boundaries are enforced, urban sprawl should not be an issue in these areas.

It should be kept in mind though that the Demarcation Board has published a notice in the Provincial Gazette on 29 May 2008, indicating a general support for the new proposed demarcation of municipal boundaries in Gauteng whereby most of the Metsweding District Municipality will be incorporated into the City of Tshwane after the 2011 municipal elections. If this incorporation goes ahead, it means that the local decision-making and planning authority for the Dinokeng Project Area will in the future rest with the City of Tshwane.

Specific spatial plans

The “*Thembisile Vision - Vision 2014*” which is relevant to the **Thembisile** IDP process indicates, amongst other development guidelines, the following:

- By 2008 no village household should not have access to clean potable water;
- By 2010 there must be decent sanitation for all, and in Mpumalanga all bucket systems must be eradicated by the end of 2005;
- By 2012 there must be electricity in all households;
- By 2014 poverty, unemployment and skills shortages should be reduced by 50% respectively; and
- By 2014 improved services to achieve a better National Health Profile and a reduction of preventable causes of death including violent crimes and road accidents, should be achieved.

Further guidance on immediate environmental priorities states that:

“First priority should be to focus on the areas around the Moloto road to clear litter dumps as 90% of all visitors to Thembisile drive along this route. Secondary to the above the refuse removal service should then be expanded to the various residential areas. As far as Environmental Management is concerned, the municipality should compile an Environmental Management Strategy for the area to regulate and manage mining and agricultural activities, drain waterlogged areas where urban expansion is required, and also to investigate the possibility of expanding the existing nature reserves to form one, comprehensive Regional Open Space System (Thembisile IDP page 77).”

The **City of Tshwane IDP** (2006-2011 pages 16-29) provides the following planning parameters:

- *“As far as bulk infrastructure and services are concerned it is generally accepted that Tshwane is well served, but, is struggling to cope with growing demand for new infrastructure, whilst also, having to upgrade ageing infrastructure.*
- *Storm water and flood management is a critical component of urban development as it can contribute significantly to human suffering and loss of life. A little more than half of all roads in the City have storm water drainage systems, which spatially, are located in the formalised urban areas. The peripheral areas are lagging behind accounting for a backlog*

estimated at R 1, 2 billion, of which R1 billion is required in the northern areas alone. In addition, a large percentage of the current storm water drainage system is under capacity due to densification trends and outdated design criteria. Addressing the enormous backlog in storm water drainage, in especially the northern areas, is extremely urgent.

- *Water provision ranks as one of the most primary services to be provided by a municipality, as it is a basic need for living and a critical component in achieving a measure of healthy living. It is estimated that there are presently almost 29 000 households in Tshwane without access to a basic level of water service, and almost 96 000 households without a basic access to sanitation. It evidences, that the City struggles to provide adequate water infrastructure to its residents which are growing at a rapid rate.*
- *Targets have been set to ensure that 100% of households have access to basic sanitation facilities.*
- *Electricity is primarily supplied by the City, although peripheral areas to the north and south-west are supplied by Eskom. Urban expansion, economic development, population influx and increase in household demand, have placed enormous pressure on power supply, so much so, that the City can barely cope with meeting status quo demand. In addition incorrect load forecasts for Centurion have led to an insufficient supply in the area resulting in power supply interruptions. While statistics do not necessarily show the shortfall, the IDP needs analysis reveals that residents are widely dissatisfied with existing service delivery. Concerns / needs include electricity outage, insufficient supply, illegal connections, lack of street lighting and cable theft leaving residents in the dark. Of all needs identified in the IDP process, electricity needs rank the highest (viz. prevalent within most wards).*
- *The City is currently impacted by various pollution sources and large quantities of liquid and solid hazardous and non-hazardous waste. This pollution impacts on water, air and land. The appropriate management and prevention of this pollution is vital to ensure clean and healthy living. The needs analysis has shown that waste management, viz. illegal dumping, proper service provision and the re-cycling of waste are prevalent community concerns.*
- *In dealing with all sub-sectors of bulk infrastructure and service provision the City's strategic objective is to "provide quality basic services and infrastructure" in terms of which it has listed the following key performance areas:*
 - *Eradicate / reduce infrastructure backlogs;*
 - *Provide quality infrastructure for growth;*
 - *Ensure maintenance of existing infrastructure;*
 - *Ensure optimal resource utilisation;*
 - *Formalise informal settlements*

- *Explore alternate sources of energy (non-conventional); and*
- *Optimise labour intensity and community involvement.”*

The **Nokeng tsa Taemane** IDP (Review 2008-2009) reflects on the need to ensure basic services and hopes to address these shortages through the various departments' goals driven plans that include:

Economic development goals:

- To facilitate the diversification of the formal economic sector.
- To facilitate local economic development (LED) by giving expression to Government and Provincial Local Economic Development Initiatives.
- To facilitate community economic development programmes.
- Marketing the Nokeng tsa Taemane Local Municipality.

Environmental goals:

- To ensure the sustainability of both the natural and built environment of the Nokeng tsa Taemane Local Municipality.
- Preserve the ridges and valleys within the Nokeng tsa Taemane Local Municipality.
- Recognition and support of private and public environmental organisations and initiatives.
- All residents must be incorporated into a formal waste removal system for the different types of waste generated.
- Providing waterborne sewerage to all households in the next 5 years.

Tourism implementation plans:

- Dinokeng initiative: Promote tourism to unlock potential.
- Eco-tourism centre may possibly be considered as part of Dinokeng initiative.
- Dinokeng initiative should be supported and accommodated as far as possible.
- Gateways into and through towns are not maintained.
- Stations at Rayton and Cullinan are not optimally utilized.
- No basic skills training facilities are present within the area.
- Employment initiatives are required in the entire area.
- Investigate an Indigent Policy to assist people who cannot pay for services.
- Potential for economic development must be unlocked.
- LED funding must be accessed through business plans.

Provincial Planning

The Gauteng Department of Economic Development (DED) is responsible for planning on a provincial level, and have initiatives such as the Gauteng Spatial Development Framework (GSDF) and Urban Edge project that determine and shape the overall economic development in the province. The Dinokeng Project forms part of the overall development strategy of Gauteng both in terms of the spatial development planning that accommodates the initiative, but also in the sense that the Dinokeng Project functions as a part of the Department of Economic Development. The provincial planning frameworks are aligned with the Dinokeng initiative, and no areas of contradiction have been identified.

The only sticking point is the provincial Urban Edge which is a discrete development boundary that is intended to contain urban development within designated urban areas. The demarcated urban edge (revised in 2007/2008) follows the N1 Highway and Magaliesberg mountain range, which excludes the whole of the Nokeng Tsa Taemane Municipality (except for local islands around Rayton, Cullinan and Refilwe). This is particularly problematic as it disregards the existing mixed use nature of the area around Roodeplaas Dam, as well as the LSDF for the greater Roodeplaas area.

Recommendations from the DED have indicated to the Metsweding, Nokeng and Kungwini areas that they must compile a single consolidated SDF for the Metsweding area, as opposed to three different and overlapping plans. There is, however, no recent concrete provincial planning framework applicable to the study area. The Gauteng Spatial Development Framework (GSDF) dates from 2000, and is currently in revision, with the GSDF Perspective and G2055 Vision not specifically engaging on the Dinokeng area as it is a non-critical component of the Gauteng economy and not part of the development core.

Mining

Existing mining activities are regulated through the Mining and Petroleum Resources Development Act. They are required to comply with the permits issued, and environmental management programmes associated with the authorisations.

NEMA, NEM:PAA, NEM:BA and NHRA provide various legal instruments which could assist in the regulation of mining activities in the Dinokeng area.

The NEM:PAA provides for the control and limitation of activities in protected areas. The level of protection varies according to the type of protected area. Therefore, the Dinokeng Project could use one of the instruments to enable the control and limitation of mining activities in the Dinokeng 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 Dinokeng Project to limit mining developments in the area.

Currently the EIA regulations are not applicable to mining activities. However, proposed amendments to the EIA regulations propose to include mining in the spectrum of activities that require EIA authorisations in terms of NEMA.

Until such time as a legal mechanism is in place to regulate mining activities from an environmental perspective, the Dinokeng Project Team should review and comment on the environmental management plans and programmes of proposed mining developments in or around the Dinokeng area.

3.2.5.5 Development parameters

Infill should be the focus in the Dinokeng area, and urban/rural sprawl should not be encouraged. Should the population grow to a point where infill is no longer possible, then development should not

occur in areas identified for possible future integration into the DGR. Instead, expansion areas can be located between the Cullinan road and the N4 (outside any conservation areas), in association with existing commercial and industrial complexes, and west of the N1. These areas should then be developed for mixed residential development to ensure that people from all levels of society have access to housing. Both high-end and low-medium cost housing should be located close to main routes and economic activity, e.g. Mamelodi, Hammanskraal, and Pretoria.

Lifestyle estates should also be focused in these areas close to the N1 and N4 in order to reduce their cumulative social and environmental impacts. All mitigation measures such as inclusionary housing policies and green design must be incorporated into the developments. It also goes without saying that no housing developments should be allowed within the DGR.

However, no lifestyle developments should be allowed until the Municipalities have adequately assessed the state of, and planned their targets for, services delivery.

Proposed DGR accommodation nodes (inside and outside of its borders) must complement the ambience of the DGR. For example casinos, fun fairs, shopping malls and large hotels should not be considered for the area. Initially, proposed accommodation nodes should comply with the current DGR spatial plans in terms of where nodes are located.

The land around Roodeplaat dam should not be further developed for lifestyle estates, or other types of housing. The focus should be on tourism activities and facilities in support of the larger Dinokeng project. Public access to the resource must be protected.

Agricultural land should not be densified (in terms of property sizes and population), especially not to the east, north and directly south of the DGR. Densification should only be allowed if clear confirmation is provided that it will encourage sustainable farming.

The following interventions are proposed:

- The Municipal Housing Development Plan for Metsweding District Municipality must be reviewed to deal with strategic issues such as land identification for housing development as well as addressing pertinent issues of mixed income housing developments;
- A buffer area round the DGR has to be determined to ensure that encroachment on the DGR borders is managed. It may be based on recommendations in the DGR EMP, requirements from the proposed regulations on management of nature reserves, or be designed with specific functions in mind such as to prevent the spread of animal diseases. Applications for development plans in the core area and buffer area have to go through a central responsible body to ensure integrated management between different municipalities;
- The way in which the municipalities will work jointly with GDARD and DED to manage the area must be formalised, potentially through means of a committee with representatives from the different municipalities, stakeholders and GDARD;
- To manage growth, the urban edge must be determined. Consideration must be given to the development trends and the ability and capacity of the municipalities to manage such growth and to provide engineering services to support development;
- The standards for subdivisions throughout the Dinokeng project area will have to be standardised into a single subdivision policy for the area, which is approved by the local municipality and hence will have the necessary statutory powers. A common understanding of what is feasible from an agricultural as well as conservation point of view needs to be achieved and agreed on;

- Agreement should be reached between the Dinokeng project and the Department of Minerals and Energy with regard to the issuing of licenses for mining in the Dinokeng area;
- A preparation and management plan for the in-migration of people;
- A Fire Management Plan; and
- An increase in crime should not be tolerated. Should an increase be evident, steps should be taken to increase the capacity and capability of the police services.

To monitor and manage potential impacts as a result of the DGR, all applications for development and planned developments should be communicated to the local communities via most often used local communication vehicles. All EIAs should prove that they have used these channels of communication. A formal grievances procedure should be set up as part of an ongoing participation process.

3.2.6 Individual land uses

The spatial distribution of various land uses in the DPA is described below, with reference to the three Status Quo Summary maps found under Annexure A as:

Map 1 - Status Quo Summary: Ecological Sensitivity

Map 2 - Status Quo Summary: Conservation, Tourism & Heritage

Map 3 - Status Quo Summary: Development

3.2.6.1 Nature Reserves

Current State

The Roodeplaats Dam and Nature Reserve contains abundant fish, bird and mammals including larger game species such as aardvark, Burchell's zebra, kudu, waterbuck, warthog, impala, blue wildebeest, common duiker and steenbok. Over 170 bird species have been recorded around the dam and nature reserve. The Rust-de-Winter Nature Reserve contains suitable habitats for several mammal, bird, reptile and amphibian species. Other nature reserves include Leeuwfontein as well as Mdala Nature Reserve and Mkhombo Dam area. The various conservation areas have their own particular legislation and policies that ensure the area's protection, namely that conservation interests should supersede individual interests.

Two other areas of particular sensitivity are farms in the Rynoue agricultural holding and those in/adjacent to the Buffelsdrift Conservancy.

Management objectives (Desired State)

Biodiversity conservation forms an integral part of the core project focus namely a nature-based tourism economy. Conservation planning and management therefore needs to maintain and enhance the state of the natural environment found in Dinokeng. All areas demarcated by the Provincial Conservation Plan as 'Irreplaceable' or 'Important' must be conserved, along with ridges and watercourses. This will ensure that viable and connected units of sensitive habitat remain in the area.

Adequate and responsible management of existing nature reserves that includes carrying capacities (game numbers), fence repairs, the implementation of a natural fire regime as well as an alien vegetation removal programme is required for each reserve area. The reserves must also form part of larger conservation networks in order to reduce the fragmentation of ecosystems and habitats, and maximise the resilience of those systems.

Formal conservation status must be assigned to the DGR.

3.2.6.2 *Conservancies*

Current State

Conservancies are valuable resource protectors and have established a good record in the conservation of natural habitats as well as threatened faunal species. Various conservancies are identified and described within the Dinokeng Integrated Tourism Framework (DITF), namely:

- Amakulu Conservancy
- Kameeldrift Conservancy
- Leeuwkloof Vallei Conservancy
- Bobbejaansberg Conservancy
- Brandbach Conservancy
- Cullinan Conservancy
- De Tweedespruit Conservancy
- Seringveld Conservancy
- Buffelsdrift Conservancy and Buffelsdrift Game Reserve

Management objectives (Desired State)

The potential exists to integrate individual conservancies into the larger tourism network for the DPA. The increase in land under conservation would be of a direct benefit to the conservancies as well as migratory animals. However, it would mean that management of the conservancies would have to become part of a broader management plan of the area as a whole and the co-operative relationship between GDARD, the Dinokeng Project and the conservancy owners would have to be extended and reinforced.

Conservancies are recognised under provincial associations (e.g. Gauteng Conservancy Association) and a national body (National Association of Conservancies of South Africa). These bodies provide support to their member conservancies in the form of organisational support and the formation of a peer support network. They also have resources available for prospective or existing conservancies that include general guidance on establishing and running a conservancy, as well guidance on conservancy management planning. These information sets can be accessed at www.nacsa.org.za.

3.2.6.3 *Residential*

Current State

The following forms of residential development can be found in Dinokeng:

- Residential developments in Cullinan and Rayton towns;
- Residential development to the south of, and around Roodeplaat Dam, mostly in the form of new residential estates;

- Rural residential, ranging from agricultural holdings to farm houses on large farm portions;
- Rural villages; and
- Informal settlements.

There is a clear concentration of settlements along Moloto Road, around the dams and in the southern and south-eastern part of the study area. The larger formal settlement areas can be found in the southern part of the study area, namely Cullinan, Rayton and developments around the Roodeplaas Dam. Throughout the rest of the project area there are a few dispersed rural villages and informal settlements. The residential developments to the south of the Roodeplaas Dam are the result of outward expansion of the built-up areas in the City of Tshwane (CoT) metropolitan area, and the functional relationship of these areas is with Tshwane and not so much Nokeng tsa Taemane. Currently, the rate of growth in the informal settlements outside of the major settlement area in the Nokeng tsa Taemane area is not as large as it is in the metropolitan areas, and the informal settlements are generally small.

The urban sprawl extending from the COT municipal area across the N1 along Zambesi Road to the south of the Roodeplaas Dam is the most contentious area as far as planning and development are concerned. This area is close to the Roodeplaas Dam, which is one of the major tourism hubs of the Dinokeng project, and as such the vision of the DITDF (high natural environmental quality and tourism facilities) might be compromised.

Up to 21% of the households in Nokeng tsa Taemane and surrounding municipalities live in informal dwellings on individual properties. Of Nokeng tsa Taemane's households, approximately 15 500 (20%) households live in informal dwellings. The reduction of informal dwellings is occurring at rate lower than 1.0% per annum (from 2001-2007). In addition, there are ten (10) informal settlements within the Nokeng tsa Taemane Local Municipality that require intervention. Inadequate housing negatively affects habitat and natural resources, as well as air quality.

Desired State

Residential expansion from the Tshwane metropolitan area around Mamelodi and Zambesi Drive into Nokeng tsa Taemane is a reality that requires a sustainable management strategy. The nature, density and intensity of residential development that may be permitted in these areas as well as a realistic urban development boundary that takes both environmental conservation and development needs into consideration needs to be determined. From a development planning perspective, the railway line could act as such a development boundary, with developments permitted to the south of the railway line. A detailed planning and design framework is required for the area which would ensure that aspects such as visual corridors, vistas, gateways etc. are protected.

Residential uses must be directly related to the economic activities in the area in order to ensure economic sustainability over the long term. This implies that the residential uses should be clustered around service centres or attached to tourism or farming activities, except in the far South Western corner where it will necessarily represent an expansion of the Tshwane urban complex. Residential uses that require extensive commuting to the urban centres must be discouraged, as should 'lifestyle estate' developments that can not show evidence of sustainable and high quality local economic investment (i.e. investment that generate further development by not leaking from the local economic system). Housing estates must be planned and managed in accordance with the spatial development frameworks of the municipalities.

The number of informal dwellings should be monitored. Informal settlements need to be managed to prevent further expansion, whilst 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 where such families are employed within the rural environment. Should growth in informal settlements be evident, relocation should be facilitated to areas where services are readily available, and an increase can be handled. These areas should primarily be along the N1, in the Hammanskraal area and on the northern border of the CoT (west of the N1). This will assist in preparing the area for the in-migration of people who are attracted by the economic opportunities.

There are residential estate developments occurring within the Roodeplaat Nature Reserve area (Nokeng tsa Taemane Draft IDP Review, 2008/2009) and they are seen as directly in conflict with the overall development vision of a nature-based tourism experience. These developments were approved by the municipality and GDARD for formalisation of land parcels around the dam. There is a need therefore, for the municipality to work jointly with GDARD to manage the area. According to the municipality, further subdivisions within the proclaimed area must be curbed and the existing development footprint must be maintained (Nokeng tsa Taemane Draft IDP Review 2008/2009).

Both the eradication of informal settlements and the need for accommodation of new residents will require urban expansion and housing development. Nokeng tsa Taemane Local Municipality has approved 13 Townships and there are 12 more under consideration. It has been estimated that to date, these proposed developments constitute 1 177 hectares of developable land with an estimate yield of 29 425 erven. This implies that the number of households in the municipality area may double in the next five to ten years. The Municipality therefore has to take tough decisions to allow for urban development or alternatively maintain the existing development form. Mixed housing developments should receive particular attention.

Housing developments for the next 10 years will centre on the 3 primary urban nodes of Rayton, Refilwe and Cullinan (Onverwacht settlement has also been included). The IDP (Review 2008/2009) maintains that the proximity to Moloto should be perceived as a strength, because of the large population and potential market base in that area on the periphery of Nokeng tsa Taemane.

In terms of densification and development (Nokeng tsa Taemane IDP 2008 and Metsweding Draft IDP 2006-2011), the following is noted:

- Urban development within the western part of Rayton towards Roodeplaat will be encouraged, and further development in the east of Rayton, Zonderwater prison and north of Refilwe will be discouraged;
- There are various local economic development opportunities that may arise out of the Agricultural Hubs that have been identified. The municipality should work jointly with National Department of Land Affairs to package a programme for small farmers' assistance; and
- The Nokeng IDP proposes that an investor be approached to establish a resort. The proposal is that the resort be linked to a game farm, hunting activities and a hotel.

The Bela-Bela IDP (2008/2009 page 29) aims to provide housing with the following guidelines in mind:

- *“The focus on the provision of housing should not only be on housing delivery but also on housing development with a greater positive impact for the residents to be able to sustain their livelihood within that particular locality. This implies that the future housing delivery and development that takes place within Bela-Bela should be incorporated within the vicinity of social facilities and economic opportunities to make it easier for the community to easily commute in order to obtain the services and employment opportunities.*

- *The provision of housing should be an integrated approach to development using the delivery of shelter as a primary focus but including amongst other things basic service delivery (i.e. potable water, appropriate sanitation and access to electricity), obtaining or upgrading of land tenure rights, ease access to adjacent community and economic services, job creation plus skill transfer (i.e. during construction stages) and the outcomes should also build self esteem by the end users.”*

3.2.6.4 Mining

Current State

The Metsweding district is rich in minerals, particularly alluvial sand, alluvial diamonds, clay and stone, and mining activity occurs across Dinokeng. These range from small, often illegal, prospecting operations, quarries and sand mining to large, well-established and productive mines. There are currently at least 428 locations where mining occurs, or previously occurred. 184 of these are currently active, predominantly mining sand, clay, stone and gravel. The most well-known mine is the Cullinan Diamond Mine which is a significant urban development and tourism anchor.

However, whilst mining clearly plays an important economic role in the area (contributing 20.5% of Nokeng's Gross Geographic Product in 2004 (Metsweding, 2006)), it also threatens to undermine the tourism potential of Dinokeng due to its physically invasive nature. Of concern is the visual and physical scars left on the environment by open cast/ pit/ riverine mining activities which have long-term effects, especially on the ecology and industries such as tourism and agriculture.

Mining operations not only impact on the vegetation and ecosystem, but also impact on the road system and aesthetic value of the environment. Mining activities such as mine dumps, slimes dams, quarrying and sand mining cause barren surfaces which are alien to endemic biota since very little (if any) natural vegetation is left after mining activities took place, especially if limited rehabilitation takes place. The rehabilitation of mines is often not attended to after they have closed down since they no longer provide any source of revenue, and often the species used for rehabilitation are not indigenous or endemic to the area. This type of environment is hostile to the indigenous fauna and only occasional strays may be encountered peripherally before thorough rehabilitation has taken place.

Desired State

In light of the presence of large economically viable mines (e.g. Delfsand, Vergenoeg Fluorspar, Cullinan Diamond Mine), a complete cessation of mining activity within the project area is not an option. Mining has as much a right to existence as other land uses, but only when the mining operations are conducted legally, and do not contribute negatively to the overall social and economic well-being of the local community. However, should some rationalisation such as the closure of smaller unregulated mines occur, it will result in job losses. It is very difficult to estimate the extent of overall job losses, but is likely to be small compared to the overall long-term job creation potential of the Dinokeng Project. In such a scenario, provision must be made to absorb workers who lose their jobs as a result of the closure of legal mines into the DGR project (or similar).

Five basic principles must be pursued during the development of mining resources of the Dinokeng Area:

1. No illegal mines must be left operating in the area;
2. Mining activities may not be visible or audible from public roads or tourism-related infrastructure or facilities;

3. Processing of raw material must occur in existing industrial complexes and/or outside the Dinokeng Area;
4. Transportation of materials must be planned and executed in a manner that does not detrimentally affect other activities in the area that depend on environmental quality or a rural sense of place (i.e. as opposed to congestion on roads caused by mining vehicles); and
5. New mining activities may not fragment or interrupt designated sensitive areas or corridors.

Although the mining activities in Dinokeng have been audited from a purely operational point of view as part of this study, a full administrative audit is still required. An official audit that is based on records and permits from the Dept of Mining will ascertain the legality of mining operations, allowing illegal mining operations to be dealt with as required by law. Dormant mines, and mines that pose environmental and aesthetic threats must be rehabilitated. This is especially relevant for areas where tourism is envisaged, agricultural areas and areas where the biodiversity is threatened.

No new mining activities should be permitted in the Dinokeng project area, in particular in or near areas of high tourism potential, due to the detrimental visual impacts these mining activities have on the environment, unless it can be shown that the activities will not have a detrimental effect on the overall execution of the 'tourism economy' vision for the area. This is particularly relevant for proposed new mining activities within any sensitive habitats including wetlands, rivers, ridges etc. Mining operations must therefore be operated strictly within the framework of comprehensive Environmental Impact Assessments (EIAs), Environmental Management Programme Reports (EMPR) and Environmental Management Plans (EMP) with strict control over the adequate rehabilitation of mining areas once the lifetime of the mine has expired. The Department of Mining must consult the local stakeholders and consider the impact of prospective new mining activities on the local economy prior to allocating any new prospecting or mining rights.

All existing legal mines must have an environmental management system in place that addresses mitigating measures to address visual impact and includes a rehabilitation programme.

3.2.6.5 Recreation & Tourism

Current State

According to the Integrated Tourism Development Framework for Dinokeng, the estimated Gross Geographical Product (GGP) for Dinokeng was approximately R137 million per annum in year 5 and R230 million in year 20, which represents about 2.5% of the GGP including the City of Tshwane. The Dinokeng Annual Report (2006) showed dramatically increased economic production with an estimated potential tourism spend of R3 million per day or 1.09 billion rand a year (at full capacity). This was a substantial increase from previous estimates and projections.

Tourism in the Dinokeng area currently takes the form of eco-tourism, business tourism (conferences and team building), recreation and heritage tourism. The eco-tourism is focused on the large number of game farms and lodges which are dispersed throughout the Dinokeng area. These lodges are also predominantly the focus areas for business tourism. Recreation activities include aspects such as nature trails, cycling, biking, golfing, boating and fishing. What is evident from the spatial distribution of the tourism facilities is the close relationship with the major routes in the area. This is an indication that accessibility to the tourism facilities is a major location decision factor. Cullinan town is also an important tourism destination in the area, with the focus being on heritage tourism and weekend getaways for residents of Gauteng urban areas.

A summary of tourism supply information (April 2008) provided by the Dinokeng Project indicates the following⁵:

- There are 274 diverse tourist attractions in Dinokeng contributing to a critical mass of offerings to interest visitors, including 60 graded establishments.
- Of these 274 attractions, 152 tourism attractions offer accommodation. There are 3 256 beds in 85 tourism attractions where the number of beds are known. The exact number of beds in the remaining 67 attractions is not known and is estimated at 2 546 beds (based on an average of 38 beds per establishment after excluding outliers - attractions with a disproportionately high number of beds in a category were excluded and the average calculated after exclusion). This makes up an estimated total number of beds for the destination of 5 792.

Table 3-4: Accommodation facilities

<i>Guest houses</i>	40
<i>Hotels</i>	3
<i>Self Catering</i>	24
<i>B&B</i>	13
<i>Country lodges</i>	23
<i>Game or hunting lodges</i>	21
<i>Camping & caravanning</i>	17
<i>Group camp</i>	11
Total	152

- There are a total of 91 places to eat. There are 1 262 restaurant seats distributed between 24 restaurants where the number of seats is known. The exact number of seats in 67 places to eat is not known and is estimated at 52 seats per establishment for a total of 3 484 seats after exclusion of outliers (Restaurants with more than 100 seats were excluded and the average calculated after exclusion). The estimated total number of restaurant seats is 4 746 seats.
- There are 56 wedding venues with a capacity ranging from 15 to 1 500 guests and a combined total of 3 683 wedding and events seats.
- There are 78 conference venues with a capacity ranging from 18 to 500 participants. There are 2 488 conference seats distributed between 43 conference venues where the number of seats is known. The exact number of seats in 35 conference venues is not known and is estimated at 57 seats per establishment resulting a total of 1 995 seats after excluding outliers (conference venues with more than 200 seats were excluded and the average calculated after exclusion) and a combined total of 4 483 conference seats.

Desired State

Dinokeng forms part of an important linkage to tourism activities in the area and serves as a driver for further tourism development in surrounding areas. It is a major thrust in Nokeng tsa Taemane's economic development drive, and a number of job opportunities for residents are envisaged,

⁵ Please note that due to the dynamic nature of the tourism industry, these numbers should be used only as an indication of the size of the local industry, and not as an absolute reference. The situation in reality probably includes a number of establishments that have not yet been registered or graded.

promoting investment in the area. In terms of the Metsweding District Municipality's Integrated Development Plan, 2007 – 2012:

“The ‘new’ economy in the region is Tourism. Existing visitor attractions, ranging from recreation-oriented activity at Roodeplaas Dam to mining and heritage tours in Cullinan, also offer opportunities for further development. The types of opportunities are concentrated in adventure, eco-tourism, and cultural heritage tourism.”

The level of job creation in the area from tourism activity is already significant, with about 274 tourism attractions currently directly employing an estimated 3 388 permanent and 1 129 casual employees in the Dinokeng area. This number is likely to increase. In addition, further accommodation developments may be allowed if the applicant is able to prove that access to infrastructural services is possible, and that this will not take from the needs of the current inhabitants/community.

Job creation should focus on rural families. The aim should be to provide one tourism job per household. A census survey of all households in Nokeng tsa Taemane should be completed and updated annually for this purpose. This database of households should also be used to determine training needs. Developments should also provide jobs for at least 80% of the local community – in this respect a social and labour plan should be prepared and submitted along with the development proposal. Alternatively, a business plan to assist with setting up and growing a local SMME should be submitted by the applicant and monitoring set up on the basis of an annual report that evaluates the success of the business in this respect.

The Dinokeng project is seen as an integral partner by both the District and Local Municipalities, providing a pivotal role in developing an eco-tourism industry in the area. It is envisaged that Dinokeng will create linkages throughout north-eastern Gauteng in support of eco-tourism and cultural heritage corridor development.

Tourism establishments must however be managed:

- in an environmentally sustainable manner especially in ecologically sensitive areas;
- according to a grading system and belong to a local tourism body;
- in a way that promotes a sense of isolation and adventure; and
- in accordance with the spatial development frameworks as well as the development of the DGR.

Most district and local municipality level development plans provide little guidance as to how, where and when preferred industries such as tourism will be developed and how this influences with other municipal activities such as town planning, development of facilities and infrastructure, and approval of projects and business activities. In order to support tourism industry development, provincial governments must assist local authorities in the development of concrete rules that support the industry related objectives of the Dinokeng project.

Following from the above point, coordinated economic development (in the form of industry related incentives and disincentives) across all affected provinces is key. The combination of a core Dinokeng project zone and buffer zones with restrictions or prohibitions on certain undesirable industries are important tools for the promotion of the tourism industry.

3.2.6.6 *Military*

Current State

Several portions of land that form part of military facilities are present in the study area. Chief amongst these are the Wallmansthal and Ditholo training areas due to their strategic locations adjacent to the N1 and close to the Tshwane urban complex. Training activities include overpasses by heavy aeroplanes, live ammunition manoeuvres, and emergency response actions.

Some parts of Wallmansthal, Ditholo and the properties around Rust-de-Winter are the subjects of land claims which have not yet reached finalisation.

Environmentally speaking though, it appears as if the extensive training areas provide relatively well maintained and protected habitat due to the limited use of the natural resources on these properties as well as the limitations on access to the sites.

Desired State

The SANDF has expressed their concern regarding incompatible land uses encroaching onto their properties at Wallmansthal and Ditholo. Their activities include live ammunition training and low level overpasses by aircraft, as well as related activities such as fire fighting. Ideally, therefore, they require adequate buffer zones that will put all adjacent land uses out of harms way, as well as access routes and points that will allow for emergency responses. Some of their facilities are located within the DGR, and will need to be appropriately fenced so as to separate them from the surrounding game areas.

Land claims are present on the military areas, and these must be finalised and resolved in order to provide security to whoever emerges as land owner or beneficiary. This process, along with the drive for publicly-owned portions of the DGR might require that land be purchased from the military.

3.2.6.7 *Legal and policy requirements*

All new residential development shall adhere to the principles of sustainable human settlements, as set out in cabinet approved plan for housing delivery commonly known as “*Breaking New Ground: A Comprehensive Plan for the Development of Sustainable Human Settlement*”, as well as the applicable local design standards. Nokeng tsa Taemane, for example, requires inclusionary housing and mixed-use development plans for any sizeable development proposal.

Resident/ community-based controls will be present in the conservancies. These might range from codes of conduct for day-to-day activities or design standards and criteria, to management plans for game within fenced-off areas. These governing policies must be adhered to and considered in the development of the area.

Natural resource management on any property with sensitive elements such as watercourses or pristine grassland will be guided and controlled through the various pieces of environmental legislation. This includes Nature Conservation Ordinances, EIA authorisation procedures, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) permits, CARA permits, etc.

As indicated, the current mining legislation does not provide adequate legal means (especially for the Dinokeng Project) to alter mining activities which have been duly authorised by the relevant authority in the Dinokeng area. Some of the legislation provides legal mechanisms for the management of environmental impacts from mining activities but these mechanisms do not fall under the jurisdiction of the Dinokeng Project itself. New mining activities may be controlled through the regulatory processes of NEMA, NEM:PAA, NEM:BA and NHRA. Current developments with regards to the EIA authorisation processes must be kept in mind though, as the 2009 proposed amendments make

provision for a closer relationship between mining and environmental permitting, and an obligation to consider the recommendations of Environmental Management Frameworks, but at the same time the allocation of 'exemption' rights to the Minister of Mining.

The Dinokeng Integrated Tourism Development Framework provides a framework for environmental management and land-use development. The DITF consolidates enablers, critical issues, challenges and opportunities related to taking Dinokeng. Of relevance for the EMF are:

- Tourism research and information should not only be used for marketing and product development purposes, but to also inform and adapt the EMF. Not addressing the needs and expectations of tourists will negatively impact on the project. In addition, the detailed Social Management Framework (Gauteng Provincial Government, 2005b) should be considered in the development of the Environmental Management Framework;
- Infrastructure development cannot follow tourism growth, but must proceed in parallel if growth is to be sustained. Adequate infrastructure is critical to keeping the promise to visitors, and ensuring the quality of the visitor experience is maintained. The EMF should address best practice levels of maintenance to ensure that the impacts on the natural environment and on people's experience are minimized;
- The EMF should consider marketing issues. The EMF should ensure that it contains a framework within which the overarching theme of 'All of Africa' can be used as a marketing strategy, that the traditional African culture is maintained as well as the wildlife, landscapes and adventure industry;
- Ongoing capacity building and education within communities should be addressed. Incentives to stimulate Community Based Tourism (CBT) operations and the sustainable implementation of activities should be considered. The interdependence between environmental, communal, industry, economic and policy issues should be considered to ensure sustainable tourism development. The natural and cultural environment should be enhanced, while meeting basic human needs, promoting equity and resulting in an improved quality of life for all; and
- A formal monitoring plan is needed to give effect to a monitoring and evaluation programme. The EMF should be seen as a flexible document which may be adapted to pro-actively react to monitoring results.

3.2.6.8 *Management objectives*

The Dinokeng Project must partner with the District and Local Municipalities, in order to play a pivotal role in developing an eco-tourism industry in the area.

The provision of housing should be an integrated approach to development using the delivery of shelter as a primary focus but including amongst other things basic service delivery (i.e. potable water, appropriate sanitation and access to electricity), obtaining or upgrading of land tenure rights, ease access to adjacent community and economic services, job creation plus skill transfer (i.e. during construction stages) and the outcomes should also build the self esteem of the end users.

If legal opportunities for formal and informal income generation are not created, and skills not developed in relation to opportunities for income generation, the project will not be sustainable. It is recommended that training programs targeted at residents are designed and implemented in order to maximise positive local impact.

These programs should be based on the Dinokeng skills audit (Gauteng Provincial Government, 2005a) and should focus on:

- Providing practical skills to local matriculants in areas such as business, accounting, game ranging and guiding.
- Unskilled and semi-skilled hospitality related occupations.
- Entrepreneurs involved in CBT enterprises, small tourism focused shops and tourism markets.
- Basic building, earthworks and construction activities.

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.

As visitor numbers increase, so do the demands for basic services such as policing, fire, safety and health care. Care must be taken to ensure that the ability to carry increased costs and possibly higher tax burdens is not exceeded.

Visitor management regulations should consider and manage the potential socio-cultural impacts (e.g. prohibitions on use of fuel wood). Local traditions should not become commercialized, and lose their integrity or authenticity.

Tourism information centres and facilities should not only serve as important conduits for dissemination of information to tourists but should help to collect important information on the market trends within the area, including traveller demographics, product strengths and weaknesses and itineraries.

3.2.7 Infrastructure

3.2.7.1 Water

Current state

Over 80% of households in all the municipalities, except for Dr JS Moroka Local Municipality, have access to piped water inside the dwelling, yard, or outside the yard (Statistics South Africa, 2007). Nevertheless, the water services backlogs within municipalities are still not at the desired state. For example, about 15 000 households in Nokeng Local Municipality need water services. For the majority of the municipalities, approximately 13.0% of their households have access to water below 'Reconstruction & Development Programme' (RDP)⁶ standard. Although it is only 3.0% for the City of Tshwane, it is still a substantial number of people (approximately 50 000 people). There is a stark contrast between neighbouring municipalities Dr JS Moroka and Thembisile: respectively 29.0% and 4.0% of households are below RDP standard despite both being part of Mpumalanga Province.

Desired State

Getting to the desired state does not only require new infrastructure, but also requires an upgrade of the current infrastructure. The backlog also raises concerns about water availability and the availability

⁶ With regards to water, above RDP standard is piped water in the dwelling, in the yard, or <200 meter from the dwelling

of funds. For example, for Nokeng tsa Taemane Local Municipality it has been estimated that there is a need for 10 mega litres of water storage capacity for the whole municipal area. This would require an amount of R72 million to accomplish.

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

- All households have access to water above RDP standard.
- All households have access to clean potable water.
- Existing infrastructure is maintained and current infrastructure upgraded where needed.
- Approval of developments takes into account the availability of water.
- Groundwater quality is monitored.
- 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 and assessed.
- Communities are educated about responsible water usage. Water conservation behaviour is encouraged.
- Local labour and community involvement is optimised to upgrade, maintain, and implement water infrastructure.

3.2.7.2 Sewerage

Current State

The number of households in all municipalities that have access to sanitation facilities above RDP⁷ standard is encouraging. Above 80% of households in all municipalities have access to sanitation facilities above RDP standard.

In Nokeng tsa Taemane, although there has been an increase in households with toilets above RDP standard, 6% is still using the bucket system, have pit latrines without ventilation or have no toilets. The only areas that are currently serviced with regard to sewer borne sanitation are townships of Rayton, Cullinan and Refilwe. The whole of Kameeldrift area (Kameeldrift, Derdepoort, Roodeplaat, and surrounding areas) do not have sewer borne sanitation.

Desired State

There is a need to construct a new sewer treatment plant around the Kameeldrift area or alternatively to connect to the City of Tshwane sewer lines on a negotiated basis (Nokeng tsa Taemane 2008/2009). It has been estimated that 9.2 mega litres of sanitation capacity is required in the whole municipal area. This would cost R174 million. In Refilwe there is a need to upgrade the current sewer works or where possible construct a new one as the existing sewer treatment works has reached its full capacity.

⁷ With regards to sanitation, above RDP standard is a flush toilet, dry toilet, chemical toilet, or pit latrine with ventilation. Below RDP standard is a pit latrine without ventilation, a bucket latrine, or no latrine

Soils in the Wallmansthal area allow for waterborne sewerage only, and no pit latrines. A total of 120 households in Wallmansthal still have to be serviced (Nokeng tsa Taemane IDP Review, 2008/2009).

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

- All households have access to sanitation above RDP standard
- The additional estimated 9.2 mega litres of sanitation capacity for Nokeng tsa Taemane is provided
- Other sewer networks are upgraded where needed. The focus is not so much on providing waterborne sewerage, but on providing adequate sewerage in an environmentally responsible manner
- Communities are informed and educated about the benefits of alternative sewerage systems
- Existing infrastructure is maintained
- Local labour and community involvement is optimised to upgrade, maintain, and implement sewerage infrastructure

3.2.7.3 *Waste management*

Current State

In terms of refuse removal, areas of concern are Nokeng tsa Taemane, Dr JS Moroka and Thembisile Local Municipalities. These municipalities have more households with a communal/own refuse dump/no rubbish disposal than households with refuse removal services.

In Nokeng tsa Taemane there are 5 150 households within the municipal area that require refuse removal services. This includes most of the informal settlements with the exception of Steve Bikoville. The areas that are currently serviced include Rayton, Refilwe and Cullinan. Nevertheless, dumps and littering can be observed in Refilwe. Steve Bikoville is also receiving attention in respect of refuse removal services (Nokeng tsa Taemane IDP Review, 2008/2009).

Desired State

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

- All households are incorporated into formal waste removal systems for the different types of waste generated, taking into account the context of communities;
- All litter dumps are cleared, with a focus on the Moloto Road;
- Landfill sites are managed according to standard and permit requirements. Regular methane monitoring is done in the landfill;
- Air quality is monitored and managed;
- Illegal dumping sites are identified and cleared;
- Waste is recycled; and

- Communities are informed and educated about waste management and the potential impacts on the environment and tourism.

3.2.7.4 Electricity

Current State

Like water, the majority of the community has access to grid energy (electricity), with over seven in ten households having access to electricity for lighting. Access to electricity is more prevalent in areas with high incidence of households, as a result of urban/more densely populated areas being better serviced.

The households that use wood and coal for heating are generally higher for most of the municipalities (except for Nokeng tsa Taemane Local Municipality and City of Tshwane) compared to households using these sources for lighting. In Nokeng tsa Taemane 64% of households use electricity/solar energy/gas for heating purposes and 69% use electricity/solar energy/gas for cooking purposes. Wood and coal are not popular to use for cooking, except for households in Thembisile and Dr JS Moroka Local Municipalities.

Desired State

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

- All households have access to electricity;
- The ability to supply electricity is considered when urban expansion applications are received;
- Load forecasts are done to ensure sufficient supply to the area;
- Illegal connections are identified and dealt with;
- Existing infrastructure is maintained;
- Street lighting is implemented in areas where it is needed;
- Alternative sources of energy have been explored and are implemented; and
- Local labour and community involvement is optimised to upgrade, maintain, and implement sewerage infrastructure.

3.2.7.5 Transportation

Current State

The Dinokeng area has a good network of roads and other infrastructure. The Dinokeng project area is situated next to the N1, which is one of the biggest transport corridors in the region, linking Gauteng to the Limpopo province and beyond. A new railway line is also planned along the Moloto road, which will contribute to the importance of the road as a local/regional transportation corridor. Such corridors often open up significant economic opportunities, especially along sections where development up to the present has been minimal.

From an historic point of view the NZASM railway line to Delagoa Bay passed through the area. Remains of this railway line can still be seen on the farm Pienaarspoort 339JR. To safeguard this railway line against Boer attacks the British forces built blockhouses, which have unfortunately

disappeared. It is along the same railway line that two concentration camps for black people were built.

Desired State

The DGR is likely to become a 'urban game reserve', as a growth in population and activities around the DGR close to economic opportunities are expected. Transport that will allow for less traffic on the road should be considered, but the implementation of the EMF should be carefully monitored, e.g. the railway line along the Moloto road. The Moloto Rail Corridor provides an opportunity to bring in rail as a major mode of transport into the Dinokeng area, and the rail travel itself can become a lucrative tourism operation.

With the accelerated urban growth and the ease of accessibility to the area provided by the Bakwena Platinum Corridor Toll Road (to the west) and various road upgrading projects (such as the R513 Cullinan road) the capacity for provision of bulk municipal infrastructure services is severely stressed. Similarly, the provision of portable water for urbanisation and the agricultural sector is a significant challenge. Uncoordinated and fragmented housing developments further lead to sub-optimal municipal infrastructure development and provision.

The Thembisile Local Municipality considers that, if properly developed, a belt of conservation areas can serve as a core area around which to develop a future eco-tourism and recreational precinct for the Thembisile Municipality (Thembisile IDP 2007-2008). Roads that interlink the tourism belt are, however, not in a good condition.

According to Gautrans there are several freeways in planning (implementation timeframes are well into the future though), which would have a substantial impact on tourist circulation. These are:

- The PWV2, running east-west probably just south of Roodeplaas Dam;
- The PWV 17, running north-south to just north of the PWV2, and east of Mamelodi; and
- The PWV 19, running north-south approximately half-way between Cullinan and Bronkhorstspuit

Development will naturally benefit from good access from the N1 highway that can be turned into visible gateways. Additionally, railway infrastructure needs to improve, in order to lighten the commuter load on the existing roads, but also potentially allow for an alternative mode of access. Residents of the Northern part of the study area have indicated a need for better road maintenance.

The Moloto Rail Corridor Project which has been approved by National Cabinet in April 2008 will introduce a railway line along Moloto Road (R573) and to the north of the Dinokeng project area, which will greatly enhance accessibility to the area via rail. The lack of planned railway stations on the Moloto Rail Corridor in the Dinokeng project area could however be considered to be a potential restriction. In terms of the current proposal, there will be two railway stations in the Dinokeng area, one at Zambesi Drive (location not yet determined) and one at Moloto. It could even be that the proposed Zambesi Station falls outside the Dinokeng project area. An additional railway station for tourism purposes halfway between Roodeplaas and Moloto should be negotiated.

An airport facility may be possible, but this will need to be carefully considered in terms of strategic location next to Tshwane and the impact of aircraft on the DGR and other land uses in the area. Already, a portion of the farm Doornpoort which lies just West of the N1 and adjacent to the 'Petroport' (Total filling station straddling the highway), is under investigation by the City of Tshwane Municipality for just such a purpose.

3.2.7.6 *Legal and policy requirements*

Municipal services are provided under the auspices of section 153 of the Constitution, which places the responsibility for basic service provision on the shoulders of the Local sphere of government, as well as well the Local Government: Municipal Systems Act (Act 32 of 2000) which demands basic services that, if not provided, will endanger public health, safety or the environment. Generally speaking, this extends to air quality control, waste management systems, electricity reticulation, water and sanitation services as well as municipal roads infrastructure (which often includes stormwater management systems).

Section 3 of the DFA prescribes general principles applicable to all land development which should be considered and integrated in the development of the EMF, including policy, administrative practice and laws that should promote efficient and integrated land development in that they:

- optimise the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities; and
- contribute to the correction of the historically distorted spatial patterns of settlement in the Republic and to the optimum use of existing infrastructure in excess of current needs.

In terms of section 3 of the Water Services (Act 108 of 1997), everyone has a right of access to basic water supply and basic sanitation. Every water services authority must therefore take reasonable measures to realise these rights.

Waste management falls within the parameters of the newly enacted (10 March 2009) National Environmental Management: Waste Act (Act 59 of 2008), which sets out the general framework for the full life cycle management of waste. Additionally, liquid waste has to comply with the parameters set by DWA for the release of treated effluent.

3.2.7.7 *Development parameters*

The servitudes for power lines, roads, etc. should be indicated on development plans submitted for approvals. Power lines should preferably not run through, but rather on the borders of the DGR. Visual impacts on tourist facilities and activities should be kept to a minimum. Visual, social and economic impact assessments should be compulsory specialist studies as part of the EIA for a development.

Services on the urban periphery imply an insufficient and costly spatial form. Whilst the primary object might be to enhance and improve the quality of life, specifically by responding to backlogs, it might just achieve the opposite in the long term. The provision of bulk services according to developer/ market demands and their willingness to pay for the infrastructure provision might result in an ineffective city form if it is not done in accordance with a clear spatial vision. Often, 'leap frog' developments are permitted provided that the developer installs the bulk infrastructure required to link the development to existing service networks. This then results in development that is not necessarily desirable from a spatial efficiency and sustainability point of view.

The availability or non-availability of engineering services directly impacts on economic growth. The provision and cost at which it is provided can thus be used as an instrument to attract or discourage economic growth and development in specific locations.

Socio-economic development in Dinokeng is dependent on various factors that create the conditions for the development to occur. These factors therefore act as critical triggers for collapse if they are not managed appropriately. Some of these tipping points occur where:

- Informal settlements grow and are not managed, leading to water pollution and littering;

- Water quality is below standard and water quantity is inadequate;
- Water resources are over exploited;
- The sewerage system is overburdened, and leakage occurs;
- People are forced to rely on natural resources such as wood, rivers and streams for their basic needs. This leads to pressures on the natural vegetation and an increase in downstream water pollution as up-stream communities use rivers and streams for personal hygiene, sanitation and other household chores (e.g. laundry);
- The lack of easy access to sources for heating, cooking and lighting contributes to the poverty cycle, which in turn negatively affects nutrition, health and productivity;
- Air pollution, water pollution, leaching from landfill sites, poisoning of groundwater systems and soil exceed acceptable standards;
- The inflow of people is not managed formally, also in terms of traffic congestion and road safety, environmental pollution, and sense of place;
- An imbalance is created between the natural and built environment that do not meet tourist expectations and local needs;
- Crime increases and quality of life is reduced; and
- Opportunities for local people are not created and they are unable to make these opportunities their own.

4 ENVIRONMENTAL MANAGEMENT FRAMEWORK

4.1 Status Quo & Desired State analysis

At the core of the Dinokeng Environmental Management Framework lies a comparison between the current environmental state of the study area and a future desired state. The current environmental state is depicted as environmental sensitivity maps that are compiled on the basis of information generated during the Status Quo phase of the project. This sensitivity evaluation is compared with a spatial depiction of the development trends for Dinokeng (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 8.

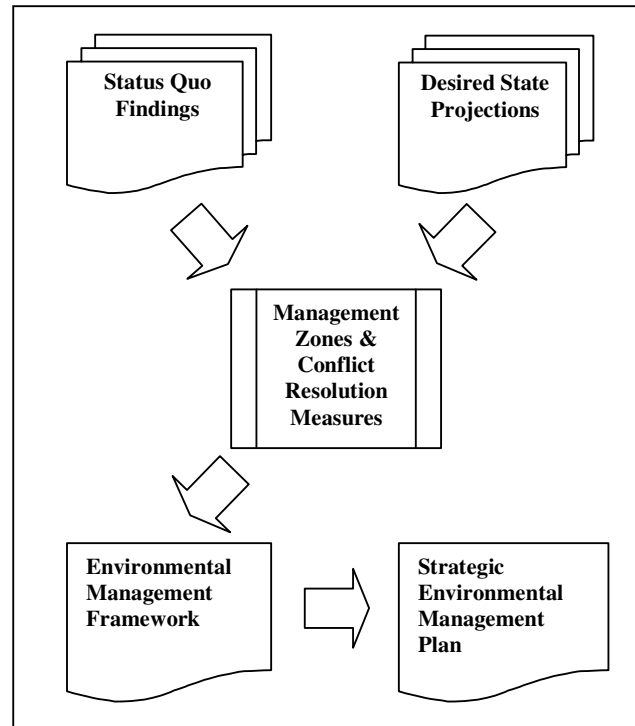


Figure 8: The environmental framework and management plan compilation process

4.2 Identification of Environmental Management Zones

The identification of management zones for the Dinokeng Project 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.

The particular process of information analysis chosen for the Dinokeng study is described in Table 4-1 below.

Table 4-1: Information analysis for the purpose of demarcating Management Zones

<i>Initial Data layer(s)</i>	<i>New Layers</i>	<i>Motivation</i>
<i>Status Quo information</i>	Summary maps: <ul style="list-style-type: none"> • Ecological Sensitivity • Development • Conservation, Tourism & Heritage 	The three summary layers are indicative of the three major constituents of any landscape, namely the natural resource base, the socio-economic reality, and the socio-cultural/recreation framework.
<i>Desired State information</i>	Projection maps: <ul style="list-style-type: none"> • Ecological • Development planning • Tourism & Heritage • Agriculture • Infrastructure 	The different maps represent the various ‘perspectives’ or ‘themes’ that were identified during the status quo and desired state analyses as likely to grow or expand in future. The themes will be comparatively analysed to identify areas of constraint or opportunity
<i>Desired state themes vs. Summary maps</i>	Conflict areas	These areas will constitute Management Zones where particular interventions are required. Strategic management actions will be identified, and/or the most appropriate zones specifically selected in order to prevent planning conflicts (e.g. excluding agricultural expansion from the DGR).
<i>Desired state themes plus Summary maps</i>	No conflicts	If there are no conflicts between the sensitivity and desired state layers, the management zones may be accepted as viable planning guidance.

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 in Table 4-2. 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 4-2: Conflicts identified between desired land use and status quo sensitivities

		<i>Status Quo Summary</i>		
		Ecological	Development	Tourism & Heritage
<i>Desired State</i>	Ecological		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		Developments that detract from the sense of place of the Cullinan node

<i>Status Quo Summary</i>			
Tourism & Heritage			
Agriculture	Agricultural activities east of the Eland River		Agricultural activities in the DGR
Infrastructure	Fragmentary linear infrastructure installation		

4.3 Resolution of conflicts

4.3.1 Infill development in the area between the N1, N4, Cullinan and Roodeplaart

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) indicated on the Dinokeng ecological summary map. 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.

Three development options exist for this 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, the rapid densification of the Roodeplaat node and ribbon development along the road links. A complete moratorium on development would therefore be hard to enforce and difficult to motivate. In short – development, in some form or another, is coming to this area.

A complete submission to unbridled development through a *laissez faire* development approach will bring its own complications though. The Roodeplaat 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 the Nokeng municipal area 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 in the Roodeplaat area. 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.

The municipality indicated that they are in the process of consolidating the two existing spatial development frameworks (Rural Areas SDF and the Urban Areas SDF), on advice of the Gauteng Department of Economic Development. This process will look at the development of a corridor along Cullinan Road as the link between the Roodeplaat Dam urban area and the Cullinan/ Rayton area. This review, and any other similar spatial planning processes, must necessarily take the ecological network into consideration.

Considering the inevitable development, the Dinokeng Project has to consider ways in which the compatibility of urbanisation and ecological sensitivity can be enhanced. These could include:

- 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.

- 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.

- 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.

- 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.

- 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).

4.3.2 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.

Conservation can however not be deemed more important a land use than mining, as both have a part to play in the economic development of the region and the country, and neither can 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. In the context of the Dinokeng Project, this decision should be based on which land use has the greater benefit for the project as a whole – i.e. whether or not the activities will promote or prevent the objectives of the Dinokeng Project being realised in the immediate vicinity and the region. Generally speaking, the following determinations would be applied:

- 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
- 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 DGR unless it can be proven that the activities will not materially affect the establishment and operation of the nature reserve
- Mining activities may not detract from tourism and recreational activities in designated tourism or recreational hubs, nodes or corridors
- New mining or extension of mining activities must provide for a rehabilitation program that will ensure a post-mining development or indigenous revegetation, with no active erosion, no remnant or ongoing pollution of the surface or groundwater and at least 75% ground cover.
- Transportation of materials and the processing of raw materials 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.

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.

4.3.3 Environmental sensitivity in the agricultural hub

There is an overlap (conflict) between areas designated as part of the Nokeng/ Kungwini Agricultural Hub by the erstwhile GDACE and the areas that are designated as ecologically sensitive. The area of concern stretches from the southern reaches of the study area, between the Magaliesberg mountain and the Rayton railway line, to the Onverwacht/ Ellis Steinberg settlement and farming lands north-east of Refilwe, mostly on the eastern side of the Elands River. In this area, 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.

The conflict stems from the ecological sensitivity analysis that identifies the riverine areas along the Elands River, wetlands and remnants of primary grassland in the same area as the agricultural hub. Individually, and in combination, these constitute habitat for rare and endangered fauna and flora species, and part of the larger ecological system of the region and the province.

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.

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 4-3: 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		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 • Sustainable water supply • 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 • Buffering from the 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 therefore to do a fine grain analysis of where there are specific sensitive ecological features (wetlands, ridges, rivers and intact sections of primary grassland larger than 5ha) and to then 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 & 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).

4.3.4 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 detailed in the analysis of the conflicts between commercial agriculture and ecological function in Table 4-3 above, both cultivation and animal husbandry may represent areas of potential incompatibility with the DGR ideal. 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 4-3 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 4-3.

4.3.5 Fragmentary linear infrastructure

It is known that the installation and subsequent maintenance of linear infrastructure in the form of 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:

- 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.

- Edge effects

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.

- 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 of the Dinokeng area, 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.

4.3.6 Sense of place in Cullinan

The town of Cullinan represents one of the strongest tourism nodes in the Dinokeng area and the region as a whole. Tourism and recreation in Dinokeng therefore needs to optimise and harness the existing image and further potential of Cullinan as part of the foundations of the local industry.

In recent years, however, Cullinan became increasingly 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 therefore necessary to consider the future of Cullinan within the bigger context, namely its location within the broader Dinokeng tourism project, 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 urbanisation of the town and if so, which development controls need to be put into place to protect this function.

In the Dinokeng Integrated Tourism Development Framework, the Cullinan hub is envisaged as an important component of the overall “Africa in one day” concept. The town has intrinsic tourism value, but requires further development of its tourism resources, especially in terms of accommodation, information access and integrated transportation planning. In the broader Dinokeng context, however, cultural and natural resources must be conserved and sustainably utilised for the greater good of the Dinokeng area. These sentiments are also echoed by the Metsweding Local Economic Development Framework which acknowledges the Roodeplaat 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 with no contribution to local economic development therefore needs to adapt to the tourism development priority, and not the other way round.

Methods whereby the ‘urban’ residential function can be made more compatible with the tourism focus are:

- Recognition of, and defining 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.

4.4 Environmental Management Zones

From the spatial analysis described in section 4.1, and the discussion of land use conflicts above, it becomes possible to define spatial demarcations in the form of six Management Zones:

1. The Dinokeng Game Reserve (Start-up and expansion areas)
2. Dinokeng Rural North
3. Dinokeng Rural South
4. Cultivation zone
5. Development Corridors and Consolidation Areas
6. Roodeplaat Recreation Area

As is evident from the spatial representation in **Annexure A: Map 4 – Environmental Management Zones**, 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.

4.4.1 Dinokeng Game Reserve

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.

4.4.2 Dinokeng Rural North

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.

4.4.3 Cultivation

Game farming will form part of the DGR, and stock farming will remain interspersed in the land use mixture of the Dinokeng Area, but soil dependent cultivation will necessarily be drawn to the south-eastern corner of the study area. This is where fertile soils and water for irrigation purposes, and hence also one of the provincial agricultural hubs.

The Kungwini/Nokeng Agricultural Hub is therefore designated as a specific management zone in Dinokeng.

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 in Dinokeng offer opportunities for growth in the local agricultural sector, since tourism activities inevitably include meals as part of the hospitality offering and therefore requires a supply of fresh produce.

A particular concern in the Cultivation 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 (also refer to section 4.3.3 above).

4.4.4 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), and south-west of the Roodeplaar railway line. The development spine demarcated by Nokeng tsa Taemane Municipality along the R513 between Roodeplaar 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 road⁸.

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 Roodeplaar Dam on the other end. Intensive commercial and residential development must be located within Roodeplaar, Cullinan/ Rayton and Mamelodi proper where service infrastructure, transportation and the highest density population are present.

⁸ Further explanation and motivation for this recommendation is presented in section 5.5.4.

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.

4.4.5 *Roodeplaat Recreation Area*

Tourism offerings in Dinokeng 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 Dinokeng Project 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, Boekenhoutskloof and Cullinan, but some clustering in the DGR area is also possible.

Roodeplaat Dam, however, represents the recreational hub for the Dinokeng Area. The dam area is 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.

The experience at Roodeplaat dam may also inform future plans for recreational activities in the vicinities of the Rust-de-Winter and Mkhombo Dams.

4.4.6 *Dinokeng Rural South*

The remainder of the study area south of Moloto Road constitutes areas without a particularly distinct character related to the Dinokeng scheme, or with no area-specific management and intervention requirements. 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, critical to the overall success of the Dinokeng Project, as they play a dominant role in determining the character of the area. A strong rural focus should therefore apply, with management guidelines that can guide rural development in support of the overall Dinokeng vision.

5 STRATEGIC ENVIRONMENTAL MANAGEMENT PLAN

5.1 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 Dinokeng Project SEMP is therefore to provide decision-making criteria and guidance on management activities that will steer the overall development of the Dinokeng Project 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 Dinokeng 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

5.2 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 Dinokeng 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.

5.3 Environmental objectives

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

5.3.1.1 *Objective*

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.

For the purposes of the Dinokeng Project, 'core units' 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.

5.3.1.2 *Levels of acceptable change*

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 type⁹.

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

⁹ 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.

for any development that will transform degraded portions of vegetation units of the identified three critical veld types.

The same no net loss approach will apply to wetlands in Dinokeng. 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 in Dinokeng is critical to the sustainability of development, all wetland protection and restoration offsets must occur within the boundaries of the Dinokeng Project. Offsets must result in a net gain in wetland ecosystem services.

The surface water systems 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.

Ridges represent valuable ecological and aesthetic resources. Encroachment onto them therefore permanently degrades the resources and reduces their value to the Dinokeng Project. Application of the GDACE Ridges policy is not sufficient in the Dinokeng context, due to the difference between the urbanised and rural zones in the area. The GDACE 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 (as described in section 5.3.1.1 above) may not be compromised, whilst the value of a diverse and scenic topography must be shared between affected parties.

5.3.1.3 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, 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.

5.3.2 Integrated services planning

5.3.2.1 Objective

Infrastructure must be provided in Dinokeng 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 in Dinokeng must therefore firstly align individual infrastructure projects with the main planning objectives (services backlogs, etc.) and with each other, secondly with the needs of, and opportunities presented by, the natural environment, and thirdly also with cross-cutting strategic socio-economic issues such as poverty, disaster management, etc.

5.3.2.2 *Levels of acceptable change*

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. Infrastructure planning may also not disrupt the natural functioning of critical or sensitive ecosystems.

Consequently, the design of infrastructure projects must show how the following was taken 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

5.3.2.3 *Spatial reference*

Services backlogs are well-defined by the community survey data from StatsSA. The immediate priorities are also highlighted in the various local development frameworks. 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.

5.3.3 *Environmental sustainability in design*

5.3.3.1 *Objective*

Development in Dinokeng must pursue 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.

As indicated in Figure 9, the Millennium Ecosystem Assessment project (CSIR, 2004) found that a strong relationship exists between ecosystem services and human well-being, irrespective of other influences. Changes to the natural systems therefore will have material impacts on the availability of ecosystem services for social activities and living conditions.

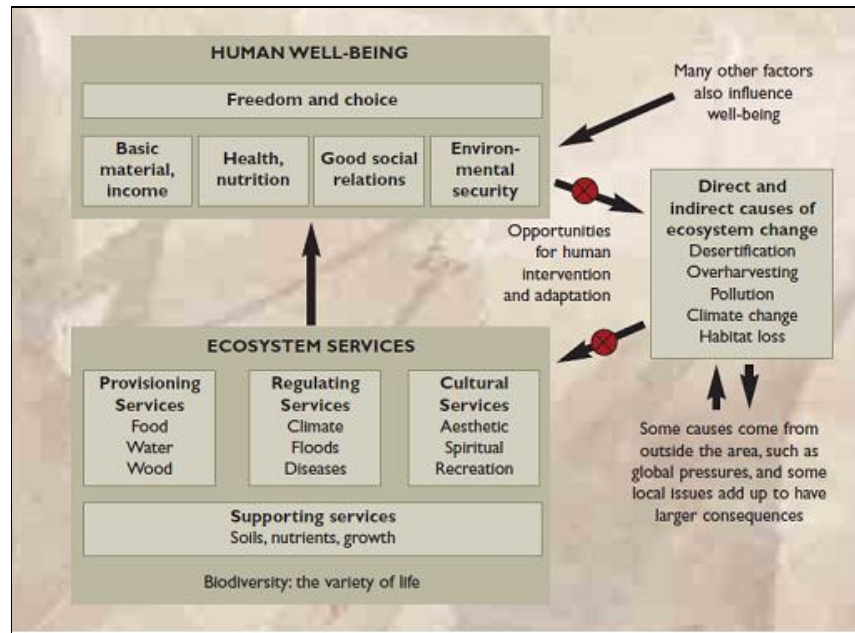


Figure 9: Relationship between ecosystem services and human well-being (CSIR, 2004)

A higher social resilience will naturally translate into more sustainable patterns and forms of resource utilisation. Communities who are not reliant on only 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.

5.3.3.2 Levels of acceptable change

- Energy
 - Efficiency

Dinokeng 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.

- Waste

All developments must make provision for recycling points – at least a central collection and sorting point, but preferably also 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.

- Water

Surface water management in the municipality must maintain the natural functioning of watercourses through appropriate stormwater management systems that incorporates 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.

- Climate change

The Dinokeng Project will 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.

5.3.3.3 *Spatial reference*

The natural systems required for sustained ecosystem functioning and services are defined by the sensitive environments management zone, but the developmental principles will apply throughout the Dinokeng Project.

5.3.4 Community-based, tourism-led development focus

5.3.4.1 Objective

Dinokeng is a geo-spatial economic development project which aims to create employment opportunities and skills development through public-private partnerships. It will be tourism-led, as tourism was identified as the economic sector with the greatest opportunities for growth and development in the area. Hence, whilst no land use will be excluded from the Dinokeng area without due merit, all development actions within the region have to be supportive of the tourism development objective.

The project will be based on the principles of Local Economic Development, which aims to use local initiative, stakeholders, resources, skills and ideas to stimulate development and employment opportunities for local residents. This will ensure that resources are applied and redistributed in a manner that benefits local stakeholders in terms of poverty alleviation, job creation and social upliftment.

5.3.4.2 Levels of acceptable change

There will be a range of different tourism developments in Dinokeng – recreational activities, heritage, nature-based tourism as well as conference and wedding facilities. These will be associated with particular zones, and therefore receive preference in those areas. Activities and developments that will impact on the tourism potential of Dinokeng may not be allowed to flourish or establish in the area.

Specifically, development may not obscure or restrict access to recreational opportunities, sterilise tourism sites; or damage heritage resources without authorisation from SAHRA.

On the other hand development should focus the attention of visitors on the tourism resources of the area, and offer services that complement the tourism facilities.

According to the DITDF, the key objectives of the Dinokeng tourism destination project encompass:

- A net increase in Gross Geographic Product (GGP) for the area by developing tourism as the leading economic sector
- Measures to ensure that revenue is retained in the local economy
- Increasing viable SMMEs, community equity and benefits especially for the historically disadvantaged communities
- Creating and growing sustainable employment, spin-off jobs, entrepreneurial and small business opportunities
- Developing an appropriate and relevant skills base to sustain the tourism sector
- Developing social services and infrastructure for tourists and local communities
- Creating improved quality of life and reducing of poverty among local communities
- Creating economic links between established and emerging tourism businesses and between the formal and informal sectors in the local communities
- Conservation and sustainable use of natural and cultural resources of the area
- Best-practice land use and ecological sustainability.

5.3.4.3 *Spatial reference*

Table 5-1: Main tourism resources in the Dinokeng Project Area

<i>Category</i>	<i>Main focus</i>
Recreation	Roodeplaat
Heritage	Cullinan, Rust-de-Winter
Conference and wedding facilities	Boekenhoutskloof (on the R573) and scattered throughout
Nature-based tourism	DGR, conservancies

5.4 Universal guidelines and policies

5.4.1 Mining

Mining will continue in the Dinokeng Area until it is no longer profitable, or until regulation or urban encroachment sterilises the mining land. In the Dinokeng Area, however, the mining activities exist side-by-side with several conservancies, and with various other development zones. Mining and nature-based activities are generally incompatible, and conflicts are present in Dinokeng, 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 5-2.

Table 5-2: 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>
<i>Active</i>		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>	<i>Rehabilitated</i>	Monitoring	Permanent vegetation	Groundwater monitoring and pollution containment or treatment programme		Early detection and corrective measures

		<i>Excavations</i>	<i>Tailings, waste rock, overburden</i>	<i>Water discharge</i>	<i>Weeds & invaders</i>	<i>Sedimentation & erosion</i>
	<i>Not rehabilitated</i>	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 in Dinokeng 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. It is therefore necessary to find ways in which stakeholder participation in the EMPR compilation process can be improved, in order to improve the quality of the environmental assessment in the report.

In the case of Dinokeng, 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.

Of course, 'the proof of the pudding lies in the eating', and the EMPR will only be as good as its implementation. Again, 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. This must also form part of the EMPR.

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 Dinokeng (following the EMF mining audit), 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 in Dinokeng.

Table 5-3: Stakeholders and responsibilities relative to mining activities

<i>Stakeholder</i>	<i>Responsibility</i>
<i>DME</i>	Mining permits Environmental considerations Permit compliance monitoring and enforcement
<i>The Dinokeng Project</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

The principles listed below (as previously identified in section 4.3.2) will ensure sustainability in the mining sector and compatibility with other land uses:

- 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
- 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 DGR unless it can be proven that the activities will not materially affect the establishment and operation of the nature reserve
- Mining activities may not detract from tourism and recreational activities in designated tourism or recreational hubs, nodes or corridors
- Mining activities may not result in significant detrimental impacts on existing residential areas.
- New mining or extension of mining activities must provide for a rehabilitation program that will ensure a post-mining development or indigenous revegetation, with no active erosion, no remnant or ongoing pollution of the surface or groundwater and at least 75% ground cover.
- Transportation of materials and the processing of raw materials 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).

5.4.2 Development planning & densification

Development planning in Dinokeng 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 for the Dinokeng Area:

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.

It is proposed that the densification parameters for farm portions in the Dinokeng project area be linked to the functional characteristics of a particular part of the Dinokeng area, as identified through the land use classification above and the management zones identified in section 4.4.

The table below (Table 5-4) sets out the densification parameters for each of these areas. A further spatial reference is provided in **Annexure A: Map 5 – Environmental Management Zones and Densification**, which matches the indicative densification guidelines to the environmental management zones. The criteria used to determine the guidelines included –

- As far as possible having similar criteria for similar land use areas;
- As far as possible aligning subdivision parameters with existing planning documents to avoid a situation where guidelines are continuously changed; and
- Looking at suitable interface parameters adjacent to sensitive areas.

The guidelines provided at this scale remain, however, conceptual rather than absolute. Exact determinations of where the boundaries between the different densification categories lie reside with the various management authorities in the Dinokeng Area. The precise determinations should be described and mapped as part of the SDF process.

Table 5-4: Densification guidelines for the Dinokeng area

Management Zone	Location in Dinokeng	Densification Parameter	Rationale
Dinokeng Game Reserve	Area to the north of the Moloto Road	No subdivisions to be permitted, except where subdivision is required for functional, DGR related purposes.	There should essentially be no need to subdivide properties that form part of the Dinokeng Game Reserve. Some functional subdivisions may be allowed to facilitate development or alignment of infrastructure. Limitation of subdivisions is recommended in order to simplify management coordination
Dinokeng Rural North	North of Moloto Road, excluding the DGR portions	No subdivisions to be permitted, except for subdivisions that are motivated by <i>bona fide</i> agricultural purposes or DGR related developments.	The Dinokeng Rural North area serves as a buffer zone to the Dinokeng Game Reserve, and as such should be conserved as a pristine natural or rural environment as far as possible.
Cultivation Zone	Gauteng Agricultural Hub: Eastern/South-eastern parts of Dinokeng	One dwelling house per 5,0 hectares	The intention with the Gauteng Agricultural Hub is to retain functional sized farming units for intensive agricultural purposes. Subdivision proposals may only be approved for <i>bona fide</i> agricultural purposes.
Roodeplaat Dam Recreation Area	Area between the R573, Railway line and Kameeldrift-Leeuwfontein Road	No subdivisions to be permitted within Roodeplaat Dam Core Conservation Area Density of 1 dwelling house per hectare outside the Core Conservation Area	As per existing planning frameworks In terms of existing Nokeng tsa Taemane Rural Areas Spatial Development Framework, subdivisions of 1 hectares are permitted in this area.
Dinokeng Rural South	Areas south of the Moloto Road that do not fall in another category	One dwelling house per 20 ha	These areas are critical to the overall success of the Dinokeng Project, as they play a dominant role in determining the character of the area. A strong rural focus should therefore apply.
Development Corridors and Consolidation Areas	Densification in terms of approved municipal spatial development frameworks. However, 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.		

<i>Management Zone</i>	<i>Location in Dinokeng</i>	<i>Densification Parameter</i>	<i>Rationale</i>
<i>Existing Agricultural Holdings</i>	Wallmansthal AH, including farm portions to the west and south of Wallmansthal AH, north of the railway line and east of N1	1 dwelling house per hectare	Rural residential densities should be restricted in order to restrict the development footprint in the Dinokeng area
	Rynoue AH	1 dwelling house per hectare	Higher rural residential densities may be permitted contiguous to urban areas
	Ellison AH and Steynberg AH	1 dwelling house per 2,0 hectares	Rural residential densities should be restricted in order to restrict the development footprint in the Dinokeng area

5.4.3 Sensitive environments

5.4.3.1 General approach

Sensitive environmental elements, namely pristine grasslands, topographic diversity, watercourses, wetlands, migration corridors and biodiversity enclaves, will always remain the lifeblood of Dinokeng. 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.

The slow urbanisation of the south 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., and can be classified as described in Table 5-5:

Table 5-5: Classification of ecosystem services (Shackleton et.al., 2008)

<i>Type of ecosystem service</i>	<i>Service rendered</i>
<i>Provisioning services (material benefits or products from ecosystems)</i>	Natural products
	Building materials for shelter
	Fuel wood
	Crops
	Fodder
	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>Type of ecosystem service</i>	<i>Service rendered</i>
<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 the sensitive environments in Dinokeng 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, however, 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.

The various responsibilities for biodiversity conservation are listed in Table 5-6:

Table 5-6: Stakeholders and responsibilities in Sensitive Environments

<i>Stakeholder</i>	<i>Responsibility</i>
GDARD	Technical guidance EIA evaluations
Local Authorities	Development applications Spatial planning
DWA	Technical guidance Water use licences
DME	EIA evaluations Best practice
Utilities	Route alignments Construction and operational best practice
The Dinokeng Project	Oversight & coordination Review of development applications

5.4.3.2 *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 throughout Dinokeng. 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, *Ichneustoma stobbiai*, Pythons and Karst systems (caves). More intensive surveys are required throughout the entire DPA in 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.

5.4.3.3 *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 consequently need to be applied in Dinokeng as the foundation of the environmental management system, in order to prevent detrimental encroachment and impacts from developments and land uses.

However, due to the finer scale of assessment used in this study, it becomes possible to recommend localised customisations of the overall conservation plan such as the identification of appropriate ecological buffers in particular areas. In this respect, three classifications are used when referring to natural open spaces in Dinokeng – core areas, buffer zones and corridors – and the guidelines below set out the necessary conservation parameters for biodiversity conservation in Dinokeng.

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.

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 in the Dinokeng area 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 5-7: Buffer zone requirements in Dinokeng

Landform	Description	Motivation	Buffer Size
Uniform landscape	'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
Diverse habitat	Naturally wooded areas Rocky ridges	Shelter available	Development may not encroach closer than 100m from the edge of the core conservation area
Watercourse in undeveloped area	Watercourses with intact riverine vegetation clumps	Shelter and foraging available along an important migration corridor	100m from the bank of the stream
Watercourse in developed area	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
Wetlands	As defined by the Wetland delineation process prescribed by DWA	High biodiversity and high value for ecosystem services	See Table 5-10

As per the recommendations from the Desired State Analysis, buffer zones requirements pertain to specific avifauna species:

Table 5-8: Buffer zone requirements for avifauna conservation

Species	Habitat and buffer requirements
Blue Crane	400ha of contiguous suitable foraging habitat around Blue Crane breeding sites (usually in a wetland)
African Grass-Owl	100ha of suitable foraging habitat with a minimum terrestrial buffer of 170m from the edge of a wetland/stream
African Marsh-Harrier	Wetlands larger than 100ha that are identified as suitable habitat for this species must be buffered by 200m of terrestrial habitat.
White-backed Night-Heron	A buffer zone of 50m must be provided from the edge of the riparian zone

<i>Species</i>	<i>Habitat and buffer requirements</i>
White-bellied Korhaan	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.
African Finfoot	A buffer zone of 50m must be provided from the edge of the riparian zone
Lesser Flamingo	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.
Greater Flamingo	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.
Black Stork	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.
Half-collared Kingfisher	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.

5.4.3.4 Management measures for wetlands and watercourses

Following from the Desired State analysis, 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 contributes 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 5-9. 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 5-9: 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>Riparian Zone</i>	<i>Development controls</i>
<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 5-10 indicates the buffer zone sizes applicable in Dinokeng:

Table 5-10: Buffer zone requirements for wetlands (Developed for Cape Nature, from CSIR, J.Nel, pers. comm.)

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

5.4.4 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 5-11: 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

Skills development programs should be based on the Dinokeng skills audit (Gauteng Provincial Government, 2005a) and should focus on:

- Providing practical skills to local matriculants in areas such as business, accounting, game ranging and guiding.
- Unskilled and semi-skilled hospitality related occupations.
- Entrepreneurs involved in CBT enterprises, small tourism focused shops and tourism markets.
- Basic building, earthworks and construction activities.

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.

5.4.5 Institutional structures & basic services

5.4.5.1 Co-operative Governance

Dinokeng cannot deliver economic growth and prosperity on its own; neither is tourism alone the answer to socio-economic freedom. The Dinokeng Project's mandate is nevertheless limited to tourism development through investment in strategic tourism infrastructure. The project is not responsible for delivering such things as housing, education, water, sanitation or electricity. Local government consequently needs to play its part in this respect and ensure that it fulfils its own mandate and functions in order to complement Dinokeng's efforts and thereby assist in an integrated and sustainable development for the area as a whole.

The challenge is to develop a sustainable tourism destination in an area where quality of life is increased, often neglected rural dwellers are given acknowledgement and support, and economic growth occurs without irreversible damage to the natural environment.

The Dinokeng Project should therefore develop a management policy together with the municipalities, which should be adhered to - the policy should realise the importance of striking an appropriate balance between developing the area and retaining it as an unspoilt tourism destination if it is to realise the economic and social benefits of tourism visitation to the area. The DITDF emphasises that the success or failure of Dinokeng in terms land development and environmental management will for the most part be determined by the relationship with local government (who are largely responsible for these development issues), GDARD and private owners.

Harnessing the region's inherent comparative and competitive advantages in the areas of tourism, conservation and agriculture is critical.

5.4.5.2 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. In this regard, certain standards or principles identified under section 3.2.7 can be repeated:

- 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.

5.5 Management requirements for the different management zones

5.5.1 *Dinokeng Game Reserve*

5.5.1.1 *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 form¹⁰.

5.5.1.2 *Roles and responsibilities*

Table 5-12: 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 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

5.5.1.3 *Compatible land uses*

- Protected areas & nature reserves
- Conservancies

¹⁰ Proposed regulations for the proper administration of nature reserves were published for comment by the Department of Environmental Affairs in August 2009

- 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

5.5.1.4 *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

5.5.1.5 *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 5-13: Policy Objectives and Management Recommendations: Land Use and Housing (Draft DGR EMP, 2009)¹¹

<i>Land Use</i>	<i>DGR context</i>	<i>Impacts</i>	<i>Policy guidelines/recommendations</i>
Formal Residential/Tourism Development	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 various forms of pollution 	<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

¹¹ 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.

<i>Land Use</i>	<i>DGR context</i>	<i>Impacts</i>	<i>Policy guidelines/recommendations</i>
			<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 banded. 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 Biko settlement. As indicated in section 1.2.4.1	<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 	<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 Biko 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

<i>Land Use</i>	<i>DGR context</i>	<i>Impacts</i>	<i>Policy guidelines/recommendations</i>
	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.	<p>due to pollution</p> <ul style="list-style-type: none"> • Impacts of littering and illegal waste disposal 	<p>installation of insulation to reduce the need for heating.</p> <ul style="list-style-type: none"> • 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. However, care should be taken to prevent the residential areas from acting as sink habitat. • 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.
<i>Industrial/ Commercial</i>	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.	<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

<i>Land Use</i>	<i>DGR context</i>	<i>Impacts</i>	<i>Policy guidelines/recommendations</i>
			<p>hazardous substance transported, stored or handled on the site.</p> <ul style="list-style-type: none"> ○ 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 prevailing winds, distance to water bodies, boreholes and residences in the surrounding area, and on-site topography. ○ 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.
<i>Agriculture</i>	<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</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 	<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

<i>Land Use</i>	<i>DGR context</i>	<i>Impacts</i>	<i>Policy guidelines/recommendations</i>
	cultivated areas on participating properties is limited	<ul style="list-style-type: none"> 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"> 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. o Activity 1 (i): aquaculture production, including mariculture and algae farms, with a product throughput of 10,000kg or more per year. o Activity 1 (j): agri-industrial purposes, outside areas with and existing land use zoning for industrial purposes, that cover an area of 1000 square meters or more.
Mining	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
Planning and management of housing and land use	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

5.5.1.6 *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.

5.5.1.7 *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 Dinokeng EMF and DGR EMP guidelines

5.5.1.8 *Institutional structures*

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

5.5.2 ***Dinokeng Rural North***

5.5.2.1 *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.

5.5.2.2 *Roles and responsibilities*

Table 5-14: Stakeholders and responsibilities in the Dinokeng Rural North

Stakeholder	Responsibility
<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

5.5.2.3 *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 Dinokeng Project and specifically tourism activities

5.5.2.4 *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 Dinokeng project.
- Illegal mining, or mining with significant impacts on the sense of place of the Dinokeng Project or on ecological functioning

5.5.2.5 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 Dinokeng Project. 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 North 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 North 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.

5.5.2.6 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 5.4.3 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.

5.5.2.7 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)

5.5.2.8 Institutional structures

- Conservancy or residents' associations

- Fire protection association
- Coordination between authorities on mining matters

5.5.3 Cultivation

5.5.3.1 General management strategy

Intensive and extensive agricultural activities will be pursued in the Cultivation Zone of the Dinokeng area. Land use and infrastructural development must therefore relate to, or be supportive of, agricultural activities. However, the Cultivation 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.

5.5.3.2 Roles and responsibilities

Table 5-15: 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

5.5.3.3 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

5.5.3.4 *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

5.5.3.5 *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.

5.5.3.6 *Natural resource management*

Conservation of untransformed areas must comply with the standards set under sections 5.3.1 and 5.4.3 of this guideline.

5.5.3.7 *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.

5.5.3.8 *Institutional structures*

Agricultural coordination or community forum with representation from the regulatory authorities

5.5.4 *Development Corridors & Consolidation Areas*

5.5.4.1 *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 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).

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, Rayton and Refilwe/ Cullinan. 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 Leeuwfontein/ Mahube Valley urban node identified in the Nokeng Tsa Taemane SDF is not supported on both town planning and environmental management grounds:
 - The Edendalespruit 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 Edendalespruit 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 Edendalespruit 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 underserved urban areas of Mamelodi.

- 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 Dinokeng 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 Roodeplaats 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 Dinokeng. 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, and supportive of the overall Dinokeng Project.

5.5.4.2 Roles & Responsibilities

Table 5-16: 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>The Dinokeng Project</i>	Advisory and oversight roles
<i>Developers and land owners</i>	Design principles application

5.5.4.3 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

5.5.4.4 Incompatible land uses

- Heavy industry

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

5.5.4.5 *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.

5.5.4.6 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.

5.5.4.7 Actions required

- Universally accepted design standards and town planning scheme.
- Monitoring and enforcement of natural resource management regulations and guidelines.

5.5.4.8 Institutional structures

Communication and interaction between authorities in order to ensure consistent and coordinated decision-making. Spatial development planning in the form of the Integrated Development Plan 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.

5.5.5 Roodeplaats Recreational Area

5.5.5.1 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 in Dinokeng will be primarily focussed around the major waterbodies – Roodeplaats, Rust-de-Winter and Mkhombo dams. Roodeplaats is already well known as a regional recreational facility, and Rust-de-Winter is increasing its popularity. 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.

5.5.5.2 *Roles & responsibilities*

Table 5-17: Stakeholders and responsibilities in the Roodeplaats Recreational Area

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

5.5.5.3 *Compatible land uses*

- Tourism & 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

5.5.5.4 *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

5.5.5.5 *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.

Roodeplaat Dam experiences water quality issues from time to time, due to the inflow of enriched runoff from the eastern parts of Tshwane and the Bavianspoort 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 Bavianspoort 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 station close to the Roodeplaat node will facilitate access to the recreation facilities.

5.5.5.6 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 5.4.3 must be followed.

A Roodeplaat resource management plan and Roodeplaat EMP are also available for the management of the dam as a whole, and the provincial nature reserve adjacent to it. Catchment management measures aimed at improving water quality, especially for the upstream areas, are required.

5.5.5.7 Actions required

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

5.5.5.8 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.

5.5.6 *Dinokeng Rural South*

5.5.6.1 *General Management Strategy*

The Dinokeng Rural South 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 these parts of Dinokeng, 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 also 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.

5.5.6.2 *Roles & responsibilities*

Table 5-18: Stakeholders and responsibilities in the Dinokeng Rural South

<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

5.5.6.3 *Compatible land uses*

- Conservancies
- Tourism & 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 overall Dinokeng Project and specifically tourism activities

5.5.6.4 *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

5.5.6.5 *Design standards, infrastructure requirements, regulatory requirements*

“Taking care of the environment” in the Dinokeng Rural South zones 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 Dinokeng Rural South 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 includes 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.

5.5.6.6 *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 5.4.3 must be followed.

5.5.6.7 *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.

5.5.6.8 *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.

5.6 **SEMP Summary**

The Strategic Environmental Management Plan for Dinokeng consists of three management levels, namely principles, universal guidelines and 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 5.3 and section 5.4 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
- Community-based, tourism-led development focus

Universal Guidelines:

- Mining
- Densification
- Specific sensitivities
- Institutional structures

Management Zones:

- DGR
- Dinokeng Rural North
- Cultivation
- Development Corridors and Consolidation Areas

- Roodeplaat Recreational Area
- Dinokeng Rural South

The Management Guidelines for individual Management Zones are summarised in Table 5-19 below, and spatially referenced on **Annexure A: Map 4 - Environmental Management Zones**.

A Responsibilities Matrix is also provided in Table 5-20.

Table 5-19: Summary of the Management Guidelines for individual Management Zones

Management Zone	General management	Compatible land uses	Incompatible land uses	Design standards	Natural resource management	Actions required	Institutional structures
DGR (Section 5.5.1, p.101)	<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
Dinokeng Rural North (Section 5.5.2, p.109)	<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 Dinokeng Project 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 Dinokeng Project 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
Cultivation (Section 5.5.3, p.113)	<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 areas - Farm stalls - Conservancies 	<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> agricultural development or in conflict with the densification parameters - Activities that permanently disturb untransformed natural vegetation 	<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 information sharing 	Agricultural coordination or community forum

Management Zone	General management	Compatible land uses	Incompatible land uses	Design standards	Natural resource management	Actions required	Institutional structures
Development corridors and consolidation areas (Section 5.5.4, p.115)	<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
Roodeplaat Recreation area (Section 5.5.5, p.119)	<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"> - ITDF - HRA - Roodeplaat EMP - 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
Dinokeng Rural South (Section 5.5.6, p.122)	<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 the Dinokeng Project 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 - 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

Table 5-20: Responsibilities Matrix

	<i>General</i>	<i>Mining</i>	<i>Sensitive Environments</i>	<i>DGR</i>	<i>Rural North</i>	<i>Cultivation</i>	<i>Consolidation</i>	<i>Roodeplaat</i>	<i>Rural South</i>
<i>The Dinokeng Project</i>	<ul style="list-style-type: none"> - Approval, adoption and promulgation of the EMF - 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"> - Oversight & coordination - Review of development applications 	<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 	
<i>GDARD</i>	<ul style="list-style-type: none"> - Approval, adoption and promulgation of the 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 guidance - EIA evaluations - Ridges policy customization - Wetlands audit and plan 	<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 - 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
<i>DME</i>		<ul style="list-style-type: none"> - Mining permits - Environmental considerations - Permit compliance monitoring and enforcement - Action against illegal mining 	<ul style="list-style-type: none"> - EIA evaluations - Best practice 						

	<i>General</i>	<i>Mining</i>	<i>Sensitive Environments</i>	<i>DGR</i>	<i>Rural North</i>	<i>Cultivation</i>	<i>Consolidation</i>	<i>Roodeplaar</i>	<i>Rural South</i>
<i>DWA</i>	- Catchment management	- Water use policing - Mine monitoring - Comments on mining applications - Action against illegal mining	- Technical guidance - Water use licences - Wetlands audit and plan			- Water oversight	- Demand side management - Integrated services planning - Stormwater management plans	- Water quality monitoring	
<i>NDA</i>		- Comments on mining applications			- Rural Development Strategy	- Agricultural support - Subdivision applications - Rural Development Strategy			- Rural Development Strategy
<i>Other government departments (e.g. DEA)</i>	- Approval, adoption and promulgation of the EMF (DEA)				- Participation in forums - Support to rural communities and farm dwellers	- Participation in forums	- Participation in forums		- Participation in forums
<i>Local Authorities (esp. town planning)</i>	- Update/revision of the SDF - Service infrastructure provision & maintenance - Subdivision policy - Catchment management	- Comments on mining applications	- Development applications - Spatial planning - Ridges policy customisation	- Adjudication of town planning applications - Adjudication of subdivision proposals	- Rural Development Strategy - Adjudication of town planning applications - Adjudication of subdivision proposals	- Rural Development Strategy - Adjudication of town planning applications - Adjudication of subdivision proposals	- Demand side management - Integrated services planning - Formalisation of an urban edge - Stormwater management plans - Adjudication of town planning applications - Adjudication of subdivision proposals - Compilation of detailed SDF plans - Integrated services planning	- Sustainable and compatible land use planning - Water quality monitoring and management - Water quality monitoring	- Land use planning and decision-making - Rural Development Strategy

	<i>General</i>	<i>Mining</i>	<i>Sensitive Environments</i>	<i>DGR</i>	<i>Rural North</i>	<i>Cultivation</i>	<i>Consolidation</i>	<i>Roodeplaats</i>	<i>Rural South</i>
<i>Utilities</i>	- Service infrastructure provision & maintenance		- Route alignments - Construction and operational best practice				- Demand side management - Integrated services planning		
<i>Developers and land owners</i>		- 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
<i>Tourism Service providers</i>		- 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			- Coordination of tourist information and strategy - Marketing - Sustainable operation of facilities - Maintenance - Quality service	
<i>Mine operators</i>		- Compliance with best mining practice, EMPs, and water use licence conditions - Water quality monitoring							
<i>Conservancies</i>		- Local policing - Comments on mining applications							- Conservation plan - Land use development control

5.7 Sustainability indicators, monitoring & continuous improvement

Environmental sustainability in the context of the Dinokeng Project will be achieved if the environmental objectives of Section 5.3 are pursued. Consequently, Table 5-21 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 in Dinokeng 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 5-21: Indicators of sustainability and monitoring framework

<i>Goal</i>	<i>Subcategory</i>	<i>Indicator</i>	<i>Where and how</i>
No net loss of ecosystem function	<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
Integrated services planning	<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
Environmental sustainability	<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>Goal</i>	<i>Subcategory</i>	<i>Indicator</i>	<i>Where and how</i>
	<i>Loss in ecosystem services</i>	Capital expenditure on infrastructure that replicates natural ecosystem functions	IDP, Annual Reports
<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

6 LEGAL AND REGULATORY PROCESS

6.1 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.

Table 6-1 provides an exposition of the various legislative reference texts that defines the role of environmental management frameworks.

Table 6-1: 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).

LEGISLATIVE REFERENCE	LEGISLATIVE TEXT
NEMA S10	<p>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 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>
EIA Regulations Chapter 8, part 1	<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.</p> <p>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 the Dinokeng area</p>

6.2 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.

In the case of Dinokeng, certain management zones could potentially be designated as geographical areas. Activities that may not occur in these management zones without the required authorisation can then be specified as well. In a similar fashion, EIA controls may be eased for activities that are generally deemed acceptable in specific areas, or under certain conditions, and the regulatory authority could be delegated. All such listings have to be properly gazetted in order to allow for public comment.

6.3 Protected Area Status

Management of the envisaged collaborative game reserve will be assisted from a legal and regulatory perspective an official management authority is designated for the reserve. This will be possible once the reserve has achieved formal protected status in terms of the National Environmental Management: Protected Areas Act (NEM:PAA)(Act 57 of 2003). Activities in a protected area can be controlled, coordinated and regulated by this management body, as opposed to fragmented, and often *ad hoc*, decisions that are made in terms of everyday land use development applications at local and provincial authority levels.

According to the Protected Areas Act, the system of protected areas in South Africa will consist of:

- special nature reserves, national parks, nature reserves (including wilderness areas) and protected environments;
- world heritage sites;
- marine protected areas;
- specially protected forest areas, forest nature reserves and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and
- mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

Of these different classifications, two in particular are relevant to the Dinokeng Project – Nature Reserves (NR) and Protected Environments (PE). Nature Reserves are intended to facilitate long term biodiversity conservation or nature-based tourism and recreation, whilst Protected Environments can prepare an area for designation as a nature reserve, act as a buffer adjacent to a nature reserve, or alternatively function as a mechanism for collective conservation action.

Table 6-2 provides a summarised comparison of the different legislative provisions pertaining to nature reserves and protected environments, as found in the Protected Areas Act.

Table 6-2: Protected area considerations for Dinokeng

<i>Aspect</i>	<i>Nature Reserve</i>	<i>NEM:PAA section</i>	<i>Protected Environment</i>	<i>NEM:PAA section</i>
Proclamation	By Ministerial or MEC notice	23	By Ministerial or MEC notice	28
Expansion	Same process as original promulgation	23	Same process as original promulgation	28
Withdrawal process	Legislature Mandatory withdrawal by MEC notice any party withdraws from the agreement (NB - see “written agreement” below)	24	MEC notice following prescribed consultation	29, 33
Purpose	Long-term biodiversity conservation Nature-based recreation or tourism	23	To enable landowners to take collective conservation action To ensure sustainable utilization of natural resources Buffer zone for NR In preparation for NR	28
Private Land	Can be included on the basis of written land owner consent and an agreement with Province Expropriation or purchasing of land use rights are possible	23, 80	Based on private landowners’ request or consent Following due notice to land owners by the MEC Expropriation or purchasing of land use rights are possible	28, 80
Exclusions	National parks, special nature reserve	23	Nature reserves	28
Consultation	All affected organs of state Lawful occupiers The Cabinet member or MEC responsible for affected state land The trustee and community for land kept in trust Newspaper notices of the intention to proclaim	32, 33, 34	Same as NR, but also written notice to all landowners (or last postal address) or affected persons	32, 33
Written agreement	Agreement must be binding, inheritable and registered against the title deed Must include the management agreements	35, 36	Same as NR, but inheritability is not specified	35, 36
Mining	No new mining allowed Existing activities to be reviewed by Minister in consultation with Mining	48	Allowed with written permission from the Minister and Cabinet member for Mining &	48

<i>Aspect</i>	<i>Nature Reserve</i>	<i>NEM:PAA section</i>	<i>Protected Environment</i>	<i>NEM:PAA section</i>
	& Energy and appropriate conditions set		Energy Existing activities to be reviewed by Minister in consultation with Mining & Energy and appropriate conditions set Must include a public consultation process	
<i>Other activities</i>	Future national regulations Any regulations promulgated by the Minister or MEC No economic activities, development, construction or farming without Management Authority approval	49, 50	Minister or MEC may publish a notice that restricts or regulates inappropriate development or activities	51
<i>Management body</i>	Minister <i>may</i> , but MEC <i>must</i> , assign management to a person, organisation or organ of state Must compile an EMP	38	Minister or MEC may assign to a person, organisation or organ of state based on consent from landowners or occupiers	38

Both designations (NR or PE) may be declared on either provincial or national level, as long as the required consultation and promulgation processes are complied with. In essence, the main difference between the two forms of legislative protection is the formal national set of management regulations for all nature reserves likely to be promulgated soon, as both designations allow for management authorities and custom regulations. A small technical difference also exists in the fact that the Minister *may*, but an MEC *must*, assign management of nature reserves to management authorities.

Relevant considerations in the case of Dinokeng's DGR and surrounding areas are summarised in Table 6-3:

Table 6-3: Implications of protected area status

<i>Consideration</i>	<i>Decision points</i>
<i>Purpose of the protected area</i>	Nature Reserves are intended as exclusively conservation areas, with a focus on recreation and tourism, and strong legislative protection (including access control). Protected environments are intended to support core conservation areas, or to give legal recognition to collaborative private conservation efforts.
<i>Protected area management</i>	Management of any protected area may be assigned to a management authority. The designation of a management authority places an obligation on that authority to compile and implement a management plan within the first year of the management responsibilities being assigned. Both may be co-managed in terms of agreements between public and private parties.

<i>Consideration</i>	<i>Decision points</i>
	National regulations for the administration of nature reserves are likely to be promulgated in the near future.
<i>Decision-making in terms of land use, development and activities</i>	If no management authority is present, then management actions default to 'normal' authorities (DEA, GDARD, Local Authority etc.) Commercial and community activities will similarly default to regular authority decision-making in the absence of an official management authority. The MEC may promulgate and administrate regulations regarding undesirable activities and development in Protected Environments though. Regulations by the Minister or MEC in regards to protected areas may " <i>restrict or prohibit any act either absolutely or conditionally</i> ". By implication, this would be able to contest decisions made in terms of the DFA on an equal footing.
<i>Coordination of local, provincial and national authority decisions</i>	A management authority may delegate administrative powers to any co-management party NEMA principles and EIA Regulations apply
<i>The control over restricted activities relating to listed threatened or protected species (NEM:BA)</i>	Any restricted activity affecting listed species (including lion, elephant, leopard and rhino) must be permitted by the national department if the activity is conducted by a provincial authority on land under its own jurisdiction.
<i>Tax breaks for environmental conservation and maintenance (Revenue Laws Amendment Act, Act 60 of 2008)</i>	Any conservation or maintenance expenditure under the auspices of a biodiversity management agreement (section 44 of the National Environmental Management: Biodiversity Act) can qualify for a tax break. Similarly, expenses incurred as part of the management of a nature reserve or protected area can qualify for deductions, as long as the protected status has a lifespan of at least 30 years. 10% of the cost or value of land and that forms part of a nature reserve agreement with duration of at least 99 years may be deemed a donation to government for the first 10 years of tax assessment.
<i>Mining activities</i>	No new mining or expansion of mining activities in a nature reserve, whereas new activities can be permitted in a PE.

Based on the considerations of Table 6-3, it is recommended that the Dinokeng Project be centred on a formally protected Dinokeng Nature Reserve, within which no new mining activities are allowed, and all land uses are regulated by a management authority. The nature reserve can extend across all properties whose owners or legal occupiers have officially signed into a nature reserve management agreement. The expected national nature reserve regulations will provide statutory regulation of land uses as soon as they are published.

Properties surrounding the nature reserve may be designated as part of a Dinokeng Protected Environment; in some cases as preparation for inclusion into the Nature Reserve, and in other cases as a protected environment in its own right. The designation as a PE allows for stewardship arrangements and benefits even when a formal management agreement or management body remains under negotiation.

6.4 Adoption, implementation and application

In terms of the adoption of the Dinokeng 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.

In brief, therefore, the following actions need to follow the public release of the final EMF report:

1. Multi-lateral agreement by the Dinokeng Project, GDARD, Metsweding District Municipality, City of Tshwane Metropolitan Municipality and Nokeng tsa Taemane Local Municipality on the adoption of the EMF.
2. Notification of the national Minister and request for concurrence.
3. Upon receipt of concurrence, official publication of the EMF by GDARD via a notice in the Government Gazette.
4. Determination of 'geographical areas' and associated 'inclusion or exclusion' activities, in consideration of the national EIA regulations.
5. Promulgation of EMF-specific EIA regulations by the MEC.

During the interim, management of planning and development activities need to continue with as much authority coordination as possible. Specifically, the Dinokeng Project Team must be afforded the opportunity to provide input into all proposed land development applications in the Dinokeng area. Legislation provides the possibility for the Dinokeng Project Team to object to any aspect of a proposed development either as part of local town planning processes or through the EIA application process. The Dinokeng Project can also appeal a record of decision which it believes will impact negatively on the sustainable development of the Dinokeng area and Dinokeng Project.

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. In terms of sub-regulation 22 and 28 of GN R385 (for basic assessment and scoping) the applicant (and more specifically the Environmental Assessment Practitioner) 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. This implies the Dinokeng Project, currently as a planning authority, but potentially as an official Management Authority for a protected area. However, the Dinokeng Project should liaise closely with the relevant authorities to ensure that it is notified of any new EIA applications in or close to the Dinokeng area until such time as decision-making can be consolidated under a specific management body.

The information and guidelines contained in the EMF may, however, be used to inform decision-making and spatial planning in the Nokeng tsa Taemane area 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 maps.

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ANNEXURE A: DINOKENG EMF MAPS