PART 2

OVERVIEW OF THE STUDY AREA

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1 SOCIO-ECONOMIC CONTEXT

The Drakenstein Municipal area includes the towns of Paarl, Mbekweni and Wellington as well as the rural hamlets of Gouda, Hermon, Saron, Windmeul and Simondium, the agricultural areas between them and the areas of undeveloped natural vegetation, much of which comprises local and provincial nature reserves (Figure 2-1).

This Chapter provides an overview of the socio-economic conditions in the Drakenstein Municipal Area, so that the riverine environment can be evaluated against the context of its demography, cultural heritage, economic profile, services and land use.

1.1 Demography

According to the 2001 census, the Drakenstein Municipality has a population of 194 422 people, making it the most populous area in the Cape Winelands District Municipality (CWDM) area. The population is however declining at a rate of –0.2 %. Approximately 82 % of the population lives in urban areas and 18 % in rural areas. The dependency rate is declining. In 2006 it was 46 %, and is expected to decline further to 43 % by 2010 (2001 Census).

The median age group is 23 years of age, and 55 % of the population is under the age of 30. There is an equal split in the gender (50.7 % males and 49.3 % females).

Sixty four percent (64 %) of the population of Drakenstein is Coloured, 21 % African and 15 % White (2001 Census).

1.2 Cultural heritage

Originating as farming communities, the Drakenstein area has maintained a close link between rural and urban environments, with vineyards forming the backbone of agriculture, and with agro-processing as well as farming inputs and services becoming increasingly important.

The Municipalities largest town, Paarl, is synonymous with South African wine-making. Just north of Paarl is Wellington, the centre of the dried fruit industry. With the opening of the Bains Kloof Pass in 1840, Paarl also became the gateway to the Cape Interior. As the two largest towns in the Municipality, Paarl and Wellington serve as the economic and political centres for the region. Beyond the southern urban area, the municipal area contains extensive agricultural areas, which especially dominate the northern areas around Saron and Gouda.

Although originally settled by San and Khoi groups, Wellington’s early history was also influenced by Huguenot settlers in 1688. Gouda and Hermon evolved as small settlements that grew up along the route to the north.
Figure 2-1: Towns and main catchments within the Drakenstein Municipal Area
1.3 Economic profile

Drakenstein has one of the highest average incomes per household in the country, with most households (57.6%) in the middle-income category. Despite this relative wealth, the socio-economic statistics show extreme deprivation and poverty amidst this wealth. Currently nearly one quarter of households in Drakenstein earn less than R800 per month and 42% of households earn below the household subsistence level (Drakenstein Municipality 2007).

Given the importance of the Drakenstein Municipal area in the Western Cape’s wine and fruit belt (Chapter 1.5), economic activities, concentrated in the towns of Paarl and Wellington, are dominated by the agro-processing industry for the fruit, wine, brandy, juice concentrate and dried fruit sectors. The trade, services and financial sectors also play a significant role, as the towns act as service centres for the surrounding region.

The major industries in the Berg River catchment are agricultural-based (Figure 2-2) (wheat, grapes and deciduous fruit) and include wineries, canneries and other food processing factories. Winelands tourism provides another major source of income. Dryland grain farming and stock farming (sheep and cattle) dominate much of the area between Wellington and the northern and western boundaries of the Drakenstein area, extending in fact as far as Veldrif, at the coast. Pine and gum plantations occur near Franschoek (Drakenstein Municipality 2006).

Tourism is also a growing economic industry in the Drakenstein area, with visitors being drawn to the diversity of nature, history, rural settings and traditional urban environments of the area.

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**Figure 2-2: Sectors of employment in the Drakenstein Municipality**

(Drakenstein Municipality 2006)
1.4 Landuse

Landuse in the Berg River catchment is primarily associated with agriculturally based industries including wineries, canneries and other food processing factories (River Health Programme (RHP) 2004). As such, vineyards and orchards dominate much of the land area surrounding the upper reaches of the Berg River, especially along the banks of the Berg River. Dryland grain farming and sheep farming predominate in the areas north of Wellington, while commercial forestry plantations exist in the headwater areas surrounding Franschoek. The only portion of the Berg River system considered to be in a near natural condition is that of the upper catchment area of the Twenty-four River (RHP 2004).

In addition to agricultural activities upstream of Paarl, there is an established golf course/ estate (Boschenmeer Estate/ Paarl Golf Course) alongside the Berg River and another (Pearl Valley Golf Estate) under development close by. There is also a golf course located alongside the Berg River near Wellington.

The urban areas consist of the two main growth towns of Paarl, including Mbekweni; and Wellington and the rural hamlets of Gouda, Hermon, Saron, Windmeul and Simonduim. There are approximately 46 268 housing units in urban areas of the Drakenstein Municipality, and a number of undeveloped open spaces within the urban edges of these areas. Industry and retail are fairly extensive in the Drakenstein, contributing 26 % and 22 % respectively to the Gross Geographic Product (GGP).

The upper catchment of the Twenty-four River remains essentially in a natural state and is an important catchment for water supply to Cape Town.

1.5 Services

The Drakenstein Municipality provides the full range of services, including waste management, water, sewage and road services. These are briefly discussed below.

1.5.1 Waste services

The Drakenstein Municipality makes use of the recently upgraded Wellington landfill site, which had an initial airspace of 1 400 000 m³. Based on the current land-filling rate of approximately 7 000 m³ per month, the site has a remaining lifespan of about 16.6 years, or 200 months from 2005. Some 60 000 tons of waste are received at the landfill per year (Drakenstein Municipality 2005).

Approximately 95 % of households in the Drakenstein Municipal area have a refuse removal service. Rubbish bags are delivered to all houses, including those in informal settlements, and filled bags collected. Hermon does not have a house-to-house refuse removal service, but makes use of a central refuse collection point system.

The waste-transfer stations and cleansing depots in all five towns need upgrading and the farms are poorly serviced (Drakenstein Municipality 2005). Some industries pay for waste disposal services offered by the Drakenstein Municipality, which provides them with skips or bins for collecting waste. Others rely on private contractors to dispose of their waste.

There is a dumpsite for builders’ rubble in the Donkervliet industrial area and the Wellington landfill site. Illegal dumping of builders’ rubble is particularly problematic. However, this
problem is addressed by hiring of appropriate equipment if and when needed, to clear away illegal material (Drakenstein Municipality 2005).

The Wellington landfill site is not permitted to receive hazardous waste, so most of this, including unknown quantities of medical waste is sent to Vissershoek landfill site, operated by the City of Cape Town.

The solid waste landfill site at Wateruintjiessvlei was closed in mid 1998, but Paarl will be responsible for the maintenance of the site for 30 years. Monitoring for methane gas and groundwater quality at this site takes place on a monthly basis.

1.5.2 Water and sewage services

Almost 98% of the 44 410 households surveyed in the 2001 census of the Drakenstein area had access to piped water. The remaining 946 households were using unreliable or unhygienic water sources. The upgrade to the water treatment plant will improve the quality of water in the Paarl Mountain supply area (State of Environment (SoE) 2005).

Some 90 - 95% of households are serviced by running water and flushing toilets. Fairyland informal settlement has communal ablution facilities, which are only partially operational due to vandalism and incorrect usage. In certain areas, high static pressure causes frequent pipe bursts and leaks, leading to service interruptions and water losses (SoE 2005).

Accidental contamination of the river system occasionally occurs due to blockages and overflows in the sewers. During rainy periods, large volumes of stormwater entering the sewer system exceed the capacity of the pipe network and waste water treatment works (SoE 2005).

There are five bulk sewage facilities for the Drakenstein Municipal area, situated at Pearl Valley, Paarl, Wellington, Gouda and Saron, and special facilities are available for winery and industrial effluent. Paarl's sewage facility is the largest, with a capacity of 35 Ml.d⁻¹. It is currently being upgraded to provide sufficient capacity until 2010. Reduction of phosphate concentrations in the final effluent to 1 mg.l⁻¹ is a requirement of the new operating permit of the facility. Once the upgrade is complete, work will begin on the Wellington facility, which currently receives more sewage than its intended capacity. This situation places enormous pressure on the facility, particularly during the summer months (SoE 2005).

The Another small WWTW is under construction at the Paarl Valley Golf Estate, which will also discharge its final treated effluent into the river. The Drakenstein Prison (previously Victor Verster) also discharges treated sewage effluent into the Berg River upstream of Paarl. In addition, there is WWTW in Saron, towards the north of the Drakenstein Municipality (downstream of Wellington), which discharges its final effluent into tributaries of the Berg River and a drying pond in Gouda for sewage treatment. The Drakenstein Municipal area also receives sewage effluent from upstream WWTW, namely the Franschoek WWTW that discharges effluent into the Franschoek River, which passes into the Berg River immediately upstream of the Drakenstein boundary.

1.5.3 Infrastructural services (summary)

### Table 2-1: A summary of infrastructural development in the Drakenstein Municipality

<table>
<thead>
<tr>
<th>Facility</th>
<th>Paarl and region</th>
<th>Wellington and region</th>
<th>Gouda and region</th>
<th>Hermon and region</th>
<th>Saron and region</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td>Wemmershoek Dam is main source (90% of demand). 10% from Nantes and Bethel dams. 14 reservoirs. 8 pump stations. All legal communities have access at home except parts of Fairyland &amp; Mbekweni (795 households use communal taps).</td>
<td>Two main sources: - Wemmershoek - Withoogte All communities have access to potable water in dwellings.</td>
<td>Provided by West Coast District Council. All households have access to potable water inside dwellings.</td>
<td>Main source: Leeuwen River. All households have access to potable water. Water demand extremely high due to vegetable gardening.</td>
<td></td>
</tr>
<tr>
<td><strong>Sewage</strong></td>
<td>Paarl Works being upgraded to provide capacity until 2010. Also serves rural sub-regions (trucked sewage). Almost all households have access to water-borne sewage. 400 households in need.</td>
<td>All households (with few exceptions) have access to waterborne sewage. Carterville (120 households) use bucket. Smallholdings, farms use soakaways. Current intake works insufficient.</td>
<td>All households have access to waterborne system.</td>
<td>Almost all households have access to waterborne sewage. 237 not linked to system, use bucket.</td>
<td></td>
</tr>
<tr>
<td><strong>Roads</strong></td>
<td>337km tarred. 15km gravel. Stormwater system insufficient in some areas.</td>
<td>127km tarred. 7km gravel.</td>
<td>6km tarred. 6km gravel.</td>
<td>1km tarred 1.5km gravel.</td>
<td>5km tarred. 18km gravel. Large areas experience inefficient stormwater drainage.</td>
</tr>
<tr>
<td><strong>Refuse removal</strong></td>
<td>14 000 bins serviced once per week &amp; 4000 twice per week. 1316 households without service.</td>
<td>7700 residences serviced once per week. 90 businesses serviced 2 to 3 times per week.</td>
<td>Household waste removed once per week.</td>
<td>Removed once per week.</td>
<td>Household waste removed once per week.</td>
</tr>
</tbody>
</table>
2 LEGISLATIVE AND POLICY CONTEXT

This chapter provides an overview of national, provincial and regional/local legislation, policies and plans that are relevant to the management of the Berg River and its major tributaries. A broad understanding of the legal foundation sets a framework that is integral for future riverine planning and management initiatives.

The South African constitution stipulates that everyone, including future generations, has the right to an environment that is not harmful to their health or well-being and to have access to clean water. For the purposes of the River EMP, the National Water Act (Act 36 of 1998) and the National Environmental Management Act (Act 107 of 1998), which are embodied in our national and provincial constitution, are important pieces of legislation. Provisions in this, and other, legislation result in the need for fine balancing between the demands of maintaining ecological integrity in our river systems and the demands for water abstraction from the Berg River Catchment. The National Water Act, for example, recognises the environment as a legitimate user of water, and not simply as part of the resource itself.

Other applicable legislation not noted in this chapter is briefly discussed in Annexures 1 to 9:

- Annexure 1: Constitution of South Africa (Relevant aspects)
- Annexure 2: Constitution of the Western Cape (Relevant aspects)
- Annexure 3: The National Environmental Management Act
- Annexure 4: National Environmental Management: Biodiversity Act
- Annexure 5: National Environmental Management: Protected Areas Act
- Annexure 6: National Heritage Resources Act
- Annexure 7: Mountain Catchment Areas Act
- Annexure 8: Conservation of Agricultural Resources Act
- Annexure 9: Municipal Systems Act

The provincial and regional context below deals with municipal policies and plans that currently exist on a national, provincial, district and sector level that are relevant to the management of the river within the Drakenstein Municipality.

National and provincial frameworks and strategies provide guidelines to the municipalities to develop their own frameworks, plans and strategies in line with national policy. A brief summary of the relevant documents not discussed in this chapter are recorded in Annexures 10 to 28. The Provincial Growth and Development Strategy (PGDS) and the Provincial Spatial Development Framework (PSDF) are discussed below. These are informants of the River EMP, and must be considered in recommendations for strategic management of river systems across the municipal areas.

The Drakenstein Municipality Spatial Development Framework (SDF) is being prepared in accordance with the prescriptions of the Western Cape Planning and Development Act, 1999 (Act 7 of 1999), the Development Facilitation Act, 1995 (Act 67 of 1995), as well as other enabling legislation. However, the principle legislation applicable to the SDF, as a sectoral plan of the Drakenstein Municipality: Integrated Development Plan (IDP) is the Local Government:
Municipal Systems Act, 2000 (Act 32 of 2000), and in particular Chapter 5. The SDF is part of the Environmental Management Framework (EMF), which will be gazetted in accordance with NEMA.

2.1 National Water Act

The National Water Act (NWA) (Act 36 of 1998) provides the legislative framework for implementing the National Water Policy (1997). The Act recognises that water is a scarce and unevenly distributed national resource and deals with water resource management and the sustainable use of water for the benefit of all users. The Act provides for the integrated management of all aspects of water resources and the delegation of management functions to a regional or catchment level so as to enable everyone to participate.

Sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. These guiding principles recognise the basic human needs of present and future generations, the need to protect water resources, the need to share some water resources with other countries, the need to promote social and economic development through the use of water and the need to establish suitable institutions in order to achieve the purpose of the Act. In terms of this Act, the responsibility for water quality and control of water pollution falls under the national government, but water services authorities have a role in the control of industrial water pollution.

The Act has made provision for the minister to appoint relevant local government to participate on the governing board of each catchment management agency. The catchment management agency is responsible for the conservation and management of the water resources in its catchment management area.

2.2 Water Services Act

The Water Services Act (Act 108 of 1997) deals with the rights of access to basic water supply and basic sanitation and sets national norms and standards for tariffs. The Act further provides for water services development plans, and sets a regulatory framework for water services institutions, water boards and water services committees. The monitoring of water services and intervention by the minister or by the relevant province, as well as financial assistance to water services institutions is also dealt with.

The Water Services Act requires the following:

- The preparation of a water services development plan by all municipalities as part of their Integrated Development Plans (IDP).
- The provision of measures by all water services authorities for the realisation of the right of every citizen to basic water supply.

In terms of this Act any municipality responsible for ensuring access to water services is defined as a ‘water services authority’. In terms of paragraph 1(2) of the Act, every water service authority must, in its water services development plan, provide for measures to realise the right that “everyone has the right of access to basic water supply and basic sanitation”.

River Environmental Management Plan: Drakenstein Municipality
2.3 National Environmental Management Act

The National Environmental Management Act (NEMA) (Act 107 of 1998)\(^1\) provides for co-operative environmental governance by establishing principles for decision making on matters effecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state, and to provide for matters connected thereto.

Chapter 1(2) of NEMA contains a set of core environmental principles that are applicable to all organs of state that may significantly affect the environment. Local Government is required to incorporate these into any policy, programme, plan or any decision made that may have a negative impact on the environment.

These principles embodied in the act and the derivatives thereof viz. National Environmental Biodiversity Act (Act 10 of 2004) and National Environmental Management Protected Areas Act (Act 57 of 2003) ensure that people and their needs are put first and that resources are shared equitably and sustainably. This is achieved through sensible environmental management and where damage or degradation cannot be avoided, that it is minimised and remedied. It furthermore encourages public participation in environmental management and the use of natural resources.

2.4 Conservation of Agricultural Resources Act

The aim of the Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983) is to provide for control over the utilization of the natural agricultural resources of the republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith. Both the control of invasive alien vegetation in riparian zones and the destruction of wetlands for agricultural and other purposes are paramount to the conservation of wetlands as envisaged in this River Environmental Management Plan (EMP).

2.5 White Paper on Environmental Management Policy for South Africa

The White Paper on Environmental Management Policy for South Africa (GN 18894 of 1998) is the government's national policy on environmental management. It sets out the vision, principles, strategic goals and objectives, and regulatory approaches that government uses for environmental management in South Africa. This overarching framework policy applies to all government institutions and to all activities that impact on the environment.

The purpose of the policy is twofold:

- To inform the public what government's objectives are and how it intends to achieve its objectives.
- To inform government agencies and state organs what their objectives are and to guide them in developing strategies to achieve those objectives.

Through this policy, government undertakes to give effect to the many rights in the Constitution that relate to the environment. They include rights relating specifically to the environment as

\(^1\) As amended in terms of the National Environmental Management Amendment Act (No 8 of 2004).
well as those relating to governance, such as the legal standing of parties, administrative justice, accountability and public participation. The policy furthermore defines the essential nature of sustainable development as the combination of social, economic and environmental factors. It takes ownership of sustainable development as the accepted approach to resource management and utilisation in South Africa, thus entrenching environmental sustainability in policy and practice.

2.6 White Paper on the Conservation and Sustainable Use of South Africa’s Biological Diversity

The publication of the White Paper on the Conservation and Sustainable Use of South Africa’s Biological Diversity (GN 1095 of 1997) was South Africa’s first step to give effect to the various measures outlined in the Convention on Biodiversity (1992). It is the government’s national policy on the conservation and sustainable use of South Africa’s biological diversity.

2.7 National Water Resource Strategy

National Water Resource Strategy (NWRS) (2004) provides the framework within which the water resources of South Africa will be managed in the future. The NWRS sets out policies, strategies, objectives, plans, guidelines, procedures and institutional arrangements for the protection, use, development, conservation, management and control of the country’s water resources. Objectives for the strategy include achieving equitable access to water, sustainable use of water and efficient and effective water use.

2.8 Catchment Management Strategies

The country has been divided into 19 Water Management Areas (WMAs), with four being located in the Western Cape. The delegation of water resource management from central government to catchment level will be achieved through the establishment of Catchment Management Agencies (CMAs) at a WMA level. Each CMA will progressively develop a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA. Department of Water Affairs and Forestry’s (DWAF) aim is to eventually hand over certain water resource management functions to CMAs, but until such time as the CMAs are established and fully operational, the Regional Offices of DWAF will continue to manage the water resource in their areas of jurisdiction.

2.9 Internal Strategic Perspective

The objective of the Internal Strategic Perspective (ISP) is to provide a framework for DWAF’s management of the water resources in each WMA, until such time as the Regional Offices can hand over its management functions to an established CMA.
2.10 Provincial context

2.10.1 Provincial Growth and Development Strategy

The Framework Agreement for Growth and Development and Social Dialogue in the Western Cape clearly specified the commitment among the social partners to pursue social dialogue with the intention of developing an agreed Provincial Growth and Development Strategy (PGDS) based on the implementation of various aspects of the Framework Agreement. Accordingly a PGDS for the Western Cape was developed and was based on a long term view of the province’s development trajectory.

Drawing on the National Spatial Development Perspective (NSDP) and the Medium Term Strategic Framework (MTSF) and working within a sustainable development paradigm, the primary purpose of the PGDS is to provide a collaborative framework to drive implementation within the Western Cape. The PGDS is not a provincial government plan but a developmental framework for the province as a whole.

At the heart of the PGDS is the paradigm of shared growth and integrated development. This paradigm intimates that shared growth and integrated development can only be achieved when the following five imperatives are strategically linked, in balance and elevated to the level of development principles:

- Economic growth
- Social equity
- Environmental integrity
- Empowerment
- Spatial integration

2.10.2 Provincial Spatial Development Framework

The Western Cape Provincial Spatial Development Framework (PSDF) was commissioned by DEA&DP as one of the eight lead strategies of *iKapa Eihlumayo*, the pillars of the Provincial Growth and Development Strategy (PGDS) (Western Cape Provincial Government 2008). The PSDF is a long-term planning instrument and its purpose is to:

- Be the spatial expression of the PGDS.
- Guide provincial and municipal integrated development plans and spatial development frameworks and plans.
- Help prioritise and align investment and infrastructure plans of other provincial departments, as well as national departments’ and parastatals’ plans and programmes in the province.
- Provide clear signals to the private sector about desired development directions.
- Increase predictability in the development environment.
- Redress the spatial legacy of apartheid.

The PSDF is a policy document and accordingly does not create or take away any rights to use of land. The PSDF takes as its starting point the goal of sustainable development.

*Sustainable development* "meets the needs of the present without compromising the ability of future generations to meet their own needs"  
Brundtland Commission
Overview of the study area

Overarching guidelines for the PSDF are provided by the National Spatial Development Perspective (NSDP), in the context of the World Summit on Sustainable Development (WSSD) 2002 by biodiversity and other national and international commitments.

2.11 Regional/ local context

Three major regional Systematic Conservation Planning exercises have been undertaken in the Western Cape, namely the Cape Action for People and the Environment (CAPE) programme, the Succulent Karoo Ecosystem Programme (SKEP), and the Subtropical Thicket Ecosystem Project (STEP). Each of them has led to a multi-sectoral biodiversity conservation programme. The CAPE programme is particularly relevant to the conservation of the natural vegetation in the Drakenstein Municipality. The Drakenstein Spatial Development Framework and Integrated Development Plan are important local forward planning documents.

2.11.1 Cape Action for People and the Environment

The Cape Action for People and the Environment (CAPE), which is funded by the Global Environmental Facility (GEF), was established to ensure the conservation of biodiversity of the Cape Floral Kingdom (CFK), and through this to deliver sustainable economic benefits to the people of the region. The CFK, of which the Drakenstein Municipal area forms a part, has been recognised as a global priority for conservation action and has been identified as a biodiversity hotspot of global significance.

In particular, the CAPE Project aims to:

- Identify conservation priorities, based on assessments of biodiversity and threats.
- Develop a long-term strategy and vision for biodiversity conservation in the Cape Floral Kingdom.
- Draft a five-year action plan and investment programme to address conservation priorities.
- Identify potential sources of funding for these activities.

CAPE’s goal

By the year 2020, the natural environment and biodiversity of the Cape Floral Kingdom will be effectively conserved, restored wherever appropriate, and will deliver significant benefits to the people of the region in a way that is embraced by local communities, endorsed by government and recognised internationally. This will be partly achieved by conserving biodiversity in priority areas, using resources sustainably; and strengthening institutions and governance.

The CAPE project has facilitated interaction among key individuals and organisations, and led to formalised interaction and inter-agency co-operation agreements. It is strongly aligned with national environmental policies and legislation. These include the Convention on Biological Diversity, the Constitution of South Africa, and the White Paper on Conservation and Sustainable Utilisation of South Africa’s Biological Diversity.

2.11.2 Drakenstein Spatial Development Framework

This Drakenstein Spatial Development Framework (SDF) aims to improve the current spatial structure and definition of urban functions within the Drakenstein Municipality and to improve access to opportunities, social, economic and otherwise, in both the urban and rural areas of the municipality.
The following strategies and interventions are proposed in support of this objective (Drakenstein Municipality 2006):

- The reinforcement of the current hierarchy of nodes (settlements).
- Development of rural service centres (RSC’s) in “rural districts”.
- Formalising emerging settlement areas.
- Providing new and upgrading existing basic infrastructure to address backlogs.
- Development of one uniform land use mechanism for the entire municipal area.
- Support for land reform projects and security of tenure for the landless.
- Promotion of a variety of housing typologies and densities to provide for all demand categories.
- Integration of historically segregated communities to build a common sense of belonging and redress the imbalances of the past.
- Providing access to the full range of urban opportunities and benefits available to all citizens.
- The alleviation of poverty and eradication of inequality based on gender.

To address poverty through economic property and social wellbeing requires healthy ecosystem functioning to provide agricultural opportunities and basic services such as clean water. A healthy ecosystem relies on the conservation of natural resources which can be achieved through the preservation of core areas that are buffered from development, protection of water catchments, minimising the loss of biodiversity and minimising pollution of natural systems including rivers. All these factors amongst others maintain river integrity. Farms that are responsibly managed can be suitable buffers to core conservation areas. Ecosystem health can be maintained through appropriate urban and rural development and conservation effort.

**Urban development**

The provincial SDF encourages urban development to be nodal and maintain an average density of 25 du/ha (dwelling units per hectare). This curbs urban sprawl and provides better access for the poor to better facilities and socio-economic activities. Nodal development usually localises development impacts and thus can be better managed. Services can also be more efficiently delivered thereby promoting environmental health.

Urban development in the Drakenstein Municipal area occurs at Paarl, Wellington, Gouda, Saron and Hermon. The identification of land for residential development for lower income groups is an important issue in Paarl and the municipality has recently commissioned Land Audit Studies for both its urban and rural areas aimed at identifying the development potential of all vacant land across the municipal area.

Coupled to this and of equal importance is the determination of limits of development to contain urban sprawl and manage urban growth. The delineation of an urban edge to clearly define the extent and direction of urban development to ensure long-term sustainability must therefore be seen as an urgent priority.

**Rural areas**

The Drakenstein Municipality has an extensive rural component with vast expanses of agricultural land (Figure 2-3) covering the majority of the municipal area from Simondium in the
south to Saron in the north. The rural areas with its scenic beauty and world-renowned wine farms and wine route do not only provide for extensive and intensive agricultural activities but also a host of tourism related opportunities.

Conservation status
South Africa's first national assessment of spatial priorities for conservation action, the National Spatial Biodiversity Assessment (NSBA), was completed in October 2004, led by the South African National Biodiversity Institute (SANBI). The NSBA supports the National Biodiversity Strategy and Action Plan, led by the Department of Environment Affairs and Tourism (DEAT). The NSBA describes how intact and well functioning terrestrial, freshwater, estuarine and marine ecosystems currently are in South Africa.

The Berg River system has been identified as one of the most severely threatened river ecosystems in the entire South Africa (SANBI 2004). The River Health Programme State-of-Rivers 2004 report on the Berg River system identifies the following issues of concern within the Berg River catchment.

- Farming practices along the river banks have resulted in the removal of natural vegetation. This, in turn, has resulted in eroding river banks causing downstream sedimentation problems in some areas and alien vegetation infestation in other areas;
- Farming activities (levees, bulldozing) have destroyed much of the riparian zone of the Berg River mainstem and lower reaches of tributaries that provide shade, shelter and food for fish.
- Inappropriate use of fertilizers, pesticides and the transfer of inferior quality water from Theewaterskloof Dam into the Berg River in summer has reduced water quality and negatively impacted indigenous fish.
- Excessive water abstraction from certain tributaries (Bosmans, Hugos, Dwars, Twenty-four) has further reduced habitat quality and fish diversity.
- The presence of invasive alien fish has also impacted severely on the indigenous fish populations in the Berg River system.
- Alien trees such as black wattle use large amounts of water throughout this catchment.
- Water hyacinth reduces habitat and water quality in the lower Berg River.
- Major sources of nutrient pollution occur in the Paarl and Wellington areas and are associated with wastewater discharges.
- Irrigation return flows are a noted problem particularly downstream of Voelvlei Dam.

Figure 2-3: Drakenstein landuse
2.11.3 Strategic Environmental Assessment of the municipality

A Strategic Environmental Assessment (SEA) was commissioned by the Drakenstein Municipality in 2005 as part of the process for the preparation of the SDF. The overall objective of the Drakenstein SDF is to provide a vision and framework for land use management and potential development in the Drakenstein Municipality. The SEA aims to provide that vision and framework from an environmental perspective, amongst others by identifying areas of significance for conservation and development and assessing all in relation to the others, to determine where development, rather than conservation (or the opposite) should occur, what type of development should receive priority in which area, etc. It must also ensure that environmental issues are addressed in the initial stages of the planning process and provide baseline information in identifying development opportunities as well as constraints.2

In keeping with the framework and objectives of the SEA, the need for developable land must be seen in relation to the value of the land for other functions and uses. The assessment completed as part of the SEA indicates that the urban industrial sector is the most significant employment sector, followed by intensive agriculture and tourism, both of which rely on the natural environment. It therefore follows that the natural environment and the intensive agricultural sector should receive as much prominence in decision-making related to development and conservation as the need for housing land.

The SEA is detailed further in Annexure 14.

2.11.4 Drakenstein Integrated Development Plan

The Drakenstein Integrated Development Plan (IDP) (2007-2012) is a strategic plan that addresses the development challenges and needs of the Drakenstein community by guiding and directing its development agenda. The following findings were included in the IDP (Drakenstein Municipality 2007):

The integrity of the environmental and cultural/historic heritage is under pressure. The quality of the natural environment is under threat due to the ongoing loss of biodiversity and decay of essential ecological systems due to poor land use management practices, unsustainable resource utilisation and general environmental decay (Drakenstein Municipality 2007). The area has some unique and healthy natural environmental habitats that are at risk if not properly managed. There is also an awareness of and justified need to address the integrity of the cultural/historic heritage.

The vision of the IDP is to address poverty through sustainable development. The mission is to develop and grow a sustainable, diverse and equitable municipality, promoting culture and opportunities which:

- Are economically viable and contributes to long term economic prosperity for all.
- Are socially just and contributes to social equality, upliftment and wellbeing.
- Contribute towards a quality living environment and does not impact on the integrity of the environment.

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2 Strategic Environmental Assessment for the Drakenstein Spatial Development Framework, EnviroDinamik, September 2005
To achieve the mission the IDP stipulates that from a community perspective, the strategic objectives for sustainable development are:

- Sustainable and quality living environment with efficient infrastructure.
- Economic prosperity based on a dynamic, diverse and shared economic base.
- Improved quality of life and social wellbeing.

The IDP strategy prioritises the importance of maintaining the environmental integrity and ultimately river quality. Among community priorities, “Municipal Infrastructure and Environment” is regarded by the IDP as the most important priority that needs to be addressed by the municipality (Drakenstein Municipality 2007).

### 2.11.5 Upper Berg River Sub-regional Plan

The following mission statement guided the Upper Berg River Sub-regional Plan (1995):

The general purpose of the plan is to provide **spatial guidelines for the future development** of the sub-region so as to promote the general well-being and order of the community in an accepted manner.

The aims of the plan are as follows:

- Utilise the physical terrain optimally so as to improve the socio-economic standards of the residents of the sub-region.
- Provide opportunities, so that all may optimise their standard of living and redress past and present inequalities.
- Enhance the character of the area.
- Link the various community facilities and urban focal points in an effective way.
- Plan an effective sub-regional transport network in order to provide good linkages.

In general this plan aims to provide a guide to development, and control of future land use in the sub-region.

The following goals and objectives have been formulated for the development of the sub-region:

- Protect both productive and aesthetic agricultural areas.
- Identify vacant land for possible further urban expansion.
- Protect historical buildings and natural areas.
- Identify nodes of social and commercial activity to facilitate job creation.
- Intensify existing urban nodes where access to employment and public transport is greatest.
- Densify existing and new developments to reduce servicing costs, contain urban sprawl and minimise travelling distances.
- Identify locations which are easily accessible for new community facilities.
2.12 Current conservation initiatives within the municipality

Various government and NGO organisations are active within the municipal boundaries with alien clearing, biodiversity, educational and other conservation orientated programmes. These organisations would also be suitable vehicles for implementing this EMP as many of them engage with landowners that are not under municipal jurisdiction with regard to conservation. These organisations include, but are not limited to:

- **Provincial Department of Agriculture: LandCare planning**
  
  - Agtergroenberg & Paarl Mountain proposals have been submitted for LandCare funding for alien clearing

- **CapeNature stewardship program**
  
  - CapeNature offers three stewardship options to landowners who wish to conserve biodiversity (namely Conservation Areas, Biodiversity Agreements & Contract Nature Reserves). They differ according to degree of restriction and amount of benefit / assistance offered by CapeNature.
  
  - The stewardship options can be regarded as a tool for the expansion of protected areas within a municipality, by securing portions of land containing critically endangered and endangered natural vegetation on private land.
  
  - Only Contract Nature Reserves are recognized as statutory protected areas in terms of the Protected Areas Act, No 57 of 2003.
  
  - A municipality may enter into a stewardship agreement with CapeNature to secure a municipally-owned area of important biodiversity and accord it appropriate status.
  
  - 2003 - Agtergroenberg Pilot Site extends from the northern slope of the Groenberg to Saron.
  
  - 2004 - Paarl Mountain - Local Authority Reserve + Adjacent Landowners.

- **South African Wine and Brandy partnership with Conservation International, CAPE and the Botanical Society (Biodiversity & Wine Initiative)**
  
  - 2004 - Paarl Mountain - Wine grape and Wine producers adjacent to Paarl Mountain.
  
  - Cape Winelands District Municipality and stakeholders – Fire Protection Agencies (FPA)
  
  - Renosterveld FPA - Agtergroenberg area and intention to establish an FPA for Paarl Mountain.

- **Department of Water Affairs and Forestry**
  
  - The Department of Water Affairs and Forestry is the custodian of South Africa's water and forestry resources. It is primarily responsible for the formulation and implementation of policy governing these two sectors. It also has override responsibility for water services provided by local government.
The Department of Water Affairs and Forestry (DWAF) has undertaken alien mapping through the Working for Water Programme from Agtergroenberg to Vöelvlei dam - members of the Renosterveld Conservancy.

**Working for Water**
- Working for Water aims to enhance water security, improve ecological integrity, restore the productive potential of land and promote sustainable use of natural resources.
- It has improved conservation of biodiversity and catchment integrity and the reduction in the frequency and intensity of fires and floods.
- It has rehabilitated degraded land with a strong emphasis on land care by the Departments of Agriculture and Land Affairs, to secure the sustainable productivity of land.

**Conservancies**
- Conservancies advance entry level conservation; the point at which ordinary people can protect the environment.
- Each conservancy creates the opportunity to inform others and to change harmful practices.
- Renosterveld Conservancy - stretches from Groenberg to the Vöelvlei Dam.

**CAPE and Putting Biodiversity Plans to Work**
- Cape Action for People and the Environment (CAPE) is a programme of the South African Government to protect the rich biological heritage of the Cape Floristic Kingdom
- CAPE seeks to unleash the economic potential of land through focused investment in development of key resources, while conserving nature and ensuring that all people benefit.
- It incorporates the consideration of biodiversity priorities into landuse decision making in pilot municipalities.

**Working for Wetlands**
- Working for Wetlands champions the protection, rehabilitation and sustainable use of wetlands through co-operative governance and partnerships.
- It is a joint initiative of the departments of Environmental Affairs and Tourism (DEAT), Agriculture (DoA) and Water Affairs and Forestry (DWAF).
- Projects focus on the rehabilitation, wise use and protection of wetlands in a manner that maximises employment creation, creates and supports small businesses and transfers relevant and marketable skills to beneficiaries.
- Offers technical expertise to landowners and collaborates with local partners to set rehabilitation objectives with the intention of improving the integrity and functioning of ecosystems.
3 PHYSICAL CONTEXT

3.1 Topography

The Drakenstein Municipality has steep mountainous slopes in the south east and along the eastern border and a small area in the south west. The mountain range along the eastern boundary of the municipality (incorporating the Limietberge and Klein-Drakensteinberge) continues northwards beyond the northern border. It is characterised by steep lateral valleys, topped by approximately 1 700 m high mountain peaks.

The topography is mostly characterised by gently undulating terrain. The land to the east of the Berg River rises in terraces to the slopes of the mountain range before reaching the steep sides of the mountains.

There are three valleys in the area; a narrow closed valley in the Franschhoek area which widens towards the northern point of Simonsberg, the valley between Paarl Mountain and the Drakenstein range and an open valley between Perdeberg and the continuation of the Drakenstein range.

3.2 Geology

The Drakenstein Municipality comprises a sequence of rocks from the Malmesbury Group, the Cape Granite Suite, the Table Mountain Group (TMG) and younger Cenozoic sediments.

The Table Mountain Group consists predominantly of erosion resistant quartzitic sandstones which result in the formation of steep rugged topography. Such topography is evident in the higher altitudes within the southern reaches and along much of the eastern edge of the municipality. Towards the lower lying western areas of the municipality the TMG erodes down to underlying Phyllite and Greywacke shales from the Malmesbury group. These shales are interspersed with lenses of quartzite schist as well as limestone.

Essentially, the Malmesbury group comprises soft, highly erodible rocks surrounded mostly by shales that form undulating plains in low lying areas. Large outcrops of erosion resistant granite from the Cape Granite Suite are present within the southern reaches of the municipality, in the form of Paarl Mountain, Perdeberg and an area extending from the Klein Drakenstein Mountains to Groenberg. Fine to medium and coarse grained alluvial deposits are present in river channels extending throughout the municipality. The implications of these formations in terms of water quality and agricultural potential are described in below.

Implications of major geological formations within the Drakenstein Municipal area for water chemistry

Soils derived from different geological formations contribute different quantities and proportions of ions and nutrients to water bodies with which they are associated (Davies and Day 1998).

Rock formations associated with the Table Mountain Group (TMG) sandstones are old and well-weathered, typically leaching very few salts and nutrients into water. Water associated with this geological group, is generally of good quality, with low Electrical Conductivity (EC) and Total Dissolved Solids (TDS) values. Table Mountain Sandstones typically yield low quantities of sediment, as they are relatively erosion resistant and associated with thin soils (Beck et al.
Formations associated with the TMG group include: Cedarberg, Goudini, Graafwater, Piekenierskloof, and Skuweberge.

Igneous rocks such as granites from the Cape Granite Suite tend to leach only slightly higher amounts of ions (both cations and anions) into water in comparison to rocks from the TMG. This results in relatively higher TDS levels, in conjunction with nominal effects on pH and buffering.

By contrast the shale-dominated geology associated with the Malmesbury Group is associated with relatively large amounts of salts (with low nutrient levels), which leach into water. Waters associated with this geology type, generally exhibit relatively high EC and TDS values. Sediment yields are usually higher from this group than in the case of Table Mountain Sandstones, as the shales are more erodible and associated with deeper soils. Formations associated with the Malmesbury group include: Morreesburg, Norree, and Porterville while two commonly occurring types of shales are Greywacke and Phyllite.

3.3 Climate

The Drakenstein Municipality falls within the Western Cape which can be described as a winter rainfall region with cool, wet winters and warm, dry summers. The topography, however results in significant changes in the micro-climate, particularly mean annual precipitation (MAP) in different areas. MAP ranges from 3 000 mm in the high-lying mountains to values as low as 837mm, 735mm and 467mm for Franschhoek, Paarl and Agter-Paarl respectively. Approximately 60 to 75 % of the MAP experienced within the municipality falls from May to August. The summers are dry, but not necessarily without rain. Heat waves lasting a few days occur reasonably frequently. The southern region of the municipality is on average about 2 °C cooler than the northern reaches. The average winter minimum is about 7 °C and snow falls on the mountain peaks annually. In general, mean annual potential evaporation in the Berg River Catchment area, which encompasses most of the municipal area, exceeds 2 000 mm.a⁻¹. Summers are generally hotter and winters generally colder than in the rest of the Cape Metropolitan region.

3.4 Natural vegetation and conservation status

The Drakenstein Municipal area is located within a region of both international and national biodiversity significance. Internationally, South Africa is recognized as the third most biologically diverse country in the world, after Indonesia and Brazil.

Within South Africa, the Cape Floristic Kingdom (which stretches from Nieuwoudtville in the west to Port Elizabeth in the east), declared a World Heritage Site in June 2004, is one of the richest areas of the world in terms of plant diversity and endemism. It is the smallest of the world’s six floral kingdoms, but has the highest concentration of plant species of which about 70 % are endemic. It is made up of eight protected areas, which together are considered important representative examples of the Cape Floristic Kingdom. This includes the Boland Mountain Complex within Drakenstein Municipality (SoE 2005).

Much of the low-lying western half of the Drakenstein Municipal area would have comprised vast expanses of Swartland Shale Renosterveld interspersed with broad swathes of Swartland Alluvium Fynbos (Figure 2-4). Towards the northern reaches of the municipality, large tracts of Swartland Alluvium Fynbos would have extended along much of the lower altitude mountain.
slopes that run along the eastern boundary of the municipality. Vast expanses of Swartland Granite Renosterveld would have dominated areas on the rising mountain slopes east of Wellington along with the majority of the east facing slopes of Paarl Mountain (Job and Driver 2006). Along the western boundary of the municipal area in the region immediately south of Perdeberg, tracts of Atlantis Sand Fynbos would have existed, along with many smaller patches of Swartland Silcrete Renosterveld (Job and Driver 2006).

The Drakenstein Municipal area is the custodian of some of the last remaining lowland renosterveld and fynbos habitats and contains some of the highest number of critically endangered ecosystems (Figure 2-5) viz. Swartland Shale Renosterveld (7% remaining), Swartland Silcrete Renosterveld (3% remaining), Swartland Granite Renosterveld (15% remaining), Swartland Alluvium Fynbos (21% remaining, Elgin Shale Fynbos (15% remaining) (Job and Driver 2006) and Cape Flats Sand Fynbos, the most transformed of the sand fynbos types with only 1% formally conserved (Mucina an Rutherford 2006). Today, renosterveld has been reduced to less than 3% of its original extent, and is now found only in isolated fragments. Less than 1% is formally protected, with the rest falling under private ownership. The largest remaining fragment of renosterveld within the Drakenstein Municipal area is found in the Elandsberg Private Nature Reserve (SoE 2005).

Three endangered ecosystems that occur within the municipal area are the Cape Winelands Shale Fynbos, Boland Granite Fynbos and Atlantis Sand Fynbos.

The total priority area, which constitutes the remaining natural vegetation, amounts to 30 000 ha of which 15 747 ha are formally protected within four provincial nature reserves viz. Limietberg-Hawequa, Limietberg-Groenberg, Waterval, the Geometric Tortoise Nature Reserve and Waterval-Voelvlei, three mountain catchment areas viz. Hottentots-Holland, Hawequa and Winterhoek and one local authority nature reserve viz. Paarl Mountain. Protected areas within the Drakenstein Municipal area make a significant contribution to biodiversity conservation.

Loss and fragmentation of natural habitat severely threatens the integrity of the remaining natural habitat in the municipality. Ecological processes typically only function well where natural vegetation remains, and in particular where the remaining vegetation is well-connected with other nearby patches of natural vegetation. The mountain catchment areas for example are effective at conserving mountain fynbos communities, which play a vital role in water supply. They act as giant sponges, soaking up water from heavy winter rainfall and slowly releasing it into streams that feed the Breede and Berg rivers. Where basic processes are intact, ecosystems are likely to recover more easily from disturbances or inappropriate actions if the actions themselves are not permanent.

Protecting biodiversity is not only important from a conservation point of view. Economic growth and development is promoted by biodiversity, because many species of plants and animals provide a support base for agriculture, fishing, tourism and traditional medicine. Maintaining a healthy biodiversity is also essential in safeguarding ecosystem services, such as water provision and erosion control (SoE 2005).
Figure 2-4: Vegetation map
Figure 2-5: Vegetation priority areas
3.5 Catchment areas and associated rivers and other wetlands

The Drakenstein Municipal area includes portions of three major catchments, namely the Molenaars/Breede, the Mosselbank/Diep and the Berg Rivers (Figure 2-6). These lie within the Department of Water Affairs and Forestry’s Berg (Berg, Diep/Mosselbank catchments) and Breede (Breede/Molenaars) Water Management Areas. Of these catchments, by far the largest portion of the Drakenstein lies within the Berg River catchment (some 54 000 ha), with the Mosselbank / Diep accounting for a relatively small area on the south west of the municipal area (some 2 080 ha), and the Molenaars River being fed by an even smaller area (1 600 ha) to the east of the Klein-Drakensteinberge. The catchments are further subdivided into subcatchment for management purposes pertaining to the River EMP.

Despite the relatively small areas represented by the catchments within the study area, they nevertheless both include important rivers from the upper reaches of these systems, implying that their management within the Drakenstein area could have ramifications for the greater systems downstream. The following sections provide an overview of these major catchments, in order to provide context for the more detailed descriptions of those portions of each catchment that fall within the boundaries of the Drakenstein Municipality itself.

Figure 2-6 shows main stem rivers and other drainage lines in the Drakenstein Municipal area, based on 1:500 000 National Rivers Cover. These drainage lines include both river channels, and numerous channelled and unchannelled valley bottom wetlands and hillside seeps, feeding into downstream systems. The following sections list the main rivers within the Drakenstein Municipal Area, in terms of the three major catchments. These rivers are described in more detail in Part 4, as part of the presentation of the situation assessment results.
Figure 2-6: Catchments, sub-catchments and rivers
3.5.1 Berg River Catchment

The Berg River is a naturally perennial system, which rises near Dwarsberg in the Franschoek and Drakenstein mountains at an altitude of 1 500 m. It drains an area of approximately 8 980 km² (DWAF 2004), before passing into the Atlantic Ocean via its estuary, near Veldrif, some 285 km away, on the West Coast. Most of the upper to lower middle reaches of the Berg River fall within the Drakenstein Municipal Area. The river is of significant regional economic importance, supplying irrigation water to an extensive agricultural area, including the winelands of the Paarl / Franschoek area, as well as being a major contributor to the water supply system of the greater Cape Town Metropolitan area and smaller cities within its catchment (RHP 2004).

The major perennial tributaries of the Berg River include the Franschoek, Wemmershoek, Dwars, Matjies, Klein Berg and Twenty-four Rivers/Leeu Rivers. The other important tributaries are the Wildeperdejag, Palmiet//Hugos, Krom/Spruit, Doring, van Wyks, Werda, Groot, Dal, Bot/Sand, Blousloot, Limiet/Kompagnies, Koopmans and Kleinberg Rivers (Figure 2-7).

Total natural runoff from the Berg River Catchments amounts to 931 Mm³ a⁻¹, 45 % of which is generated in 7 % of the total area of the Berg River catchment, located predominantly in the southern part of the Drakenstein Municipal Area.

Three major dams have been built in the catchment (Figure 2-7). The Wemmershoek Dam south east of Paarl has a surface area of 3 km² and a storage capacity of 66 Mm³. The Berg River Dam in close proximity to the Wemmershoek Dam covers an area of 5 km² and has a storage capacity of 130 Mm³. The Vöelvlei Dam west of Tulbagh covers an area of 15 km² and has a storage capacity of 170 Mm³. Numerous smaller farm dams are found throughout the eastern part of the catchment. Despite all the dams, which have controlled natural flood regimes in the downstream catchment, the Berg River in the Drakenstein region has a very high energy potential and regularly overflows its banks. In certain areas the banks are eroded causing damage to farmlands.

Extensive infilling of floodplains and berming of the river means that alluvial flood plains today occur on a limited scale, mainly in a small strip along the river. Significant alluvial deposits are found upstream from where the Wemmershoek River joins the Berg River and just north of the Palmiet River. Terraces with alluvial gravel and coarser rubble are also found along the Dwars River, indicating extensive flooding of these areas in the past.
Figure 2-7: Berg River catchment, major zones and water sampling sites
The river has sixteen major and several minor tributaries (Figure 2-7). Only six of its major tributaries are perennial systems, albeit with artificially reduced summer flows. These are: the Wemmers, Franschhoek, Klein Berg, Twenty-four and Kuils Rivers, all of which drain from the eastern side of the mainstem Berg River, while those draining from the western side are semi-perennial or seasonal. Predictably, the natural water chemistry of the tributaries is strongly correlated with their underlying geology. On these grounds, they can usefully be divided into two main classes — those rising in the TMS-dominated mountain ranges on the eastern or right hand side of the river\(^3\), referred to as “TMS rivers”, and those rising on the more level, low-lying Malmesbury shale-dominated ground along the left bank, referred to as “shale rivers” (Fourie and Steer 1971). The only exception to this is the Dwars River, which has the characteristics of the TMS rivers. The shale rivers (e.g. the Vis, Doring, Sandspruit, Moreesburg and Matjies Rivers) have naturally relatively high salinities. By contrast, TMS rivers all have low concentrations of total dissolved solids (TDS) (e.g. the Banhoek, Franschoek, Klein Berg, Leeu, Kompagnies, Wolwekloof and Twenty-four Rivers). They also tend to be naturally brown in colour, as a result of dissolved humic acids (Bath 1993).

Four species of indigenous riverine fish once occurred naturally in the Berg River catchment, two of which (the Berg River Redfin *Pseudobarbus burgi* and Cape Galaxias *Galaxias zebratus*) are endemic to the Western Cape. None of these indigenous species today are found in the main channel, which is instead dominated by alien fish species, including *Lepomis macrochirus* (bluegill sunfish), and *Micropterus salmoides* (largemouth bass) (Clark 2004).

Further downstream, however, the estuary remains however an important nursery area for marine and estuarine fish and supports a strong fishing industry, with harders *Liza richardsonii*, estuarine round herring *Gilchristella aestuaria*, Mozambique tilapia *Tilapia mossambicus*, nude goby *Caffrogobius nudiceps*, silverside *Atherina breviceps* and Knysna sand gobi *Psammogobius knyasnaensis* comprising the major catch (Clark 2004). The Berg River Estuary is considered South Africa’s second most important estuary in terms of national conservation importance for estuarine birds, fish, invertebrates and vegetation (Turpie and Clark 2007), and supports large populations of both resident bird species and Palaeartic migrants.

The mouth of the Berg River is kept permanently open by a constructed channel and dredging. Nevertheless, the estuary still reflects strong seasonal patterns. River inflow during winter creates more turbid, freshwater-dominated conditions, with limited saline intrusion near the mouth. During summer the estuary becomes marine-dominated with less turbid saline waters penetrating up to about 40 km from the mouth. Upwelling during these summer months is a typical feature along the West Coast when colder, nutrient-rich seawater is introduced into the estuary. This seasonal variability drives the ecology of the estuary.

The amount of water flowing in a river system has a profound effect on the river’s ecological functioning and integrity. The amount of water (including allocations of water for floods and flushes as well as base flows) that is needed to maintain the river in a specified condition is called the Ecological Reserve. The Ecological Reserve has been set for certain reaches of the Berg River, and includes the following:

- Ecological flow requirements of the Upper Berg River between the Berg River Dam and the confluence with the Franschhoek River (Figure 2-7) have been set by DWAF,

\(^3\) By convention, facing downstream

River Environmental Management Plan: Drakenstein Municipality
following an Instream Flow Requirement (IFR) refinement workshop and a number of IFR Scenario workshops.

- Both the flow and the water quality components of the Ecological Reserve were determined in Intermediate Reserve Determination studies, carried out for two sites on the lower Berg River, downstream of the Twenty-four River confluence and downstream of the Drakenstein Municipal area.

- No reserve has been set for the reaches downstream of the DWAF weir station G1H036 (Figure 2-7) (near Hermon), in the middle reaches of the Berg River, pending additional water chemistry and hydraulic information (Ractliffe and Dallas 2004).

- No reserve has been set for the river reaches between the Franschhoek tributary confluence and Hermon, despite the pressures in terms of both water quality and water quantity to which these reaches are subjected.

### 3.5.2 Mosselbank / Diep River catchment

The Diep River system encompasses the subcatchments associated with two major rivers, namely, the Diep River and the Mosselbank River. The only major rivers from the Drakenstein area that fall within this catchment are the Klapmuts River and the Groenfontein, along with a number of unnamed minor tributaries.

The Diep River, with its sources in the Riebeek-Kasteel Mountains, north of Malmesbury, flows south-west through Malmesbury and agricultural areas north of the Cape Town Metropolitan Area. Joined by the Mosselbank River near the town of Philadelphia, the river flows towards Table Bay where it widens out forming a large wetland known as Rietvlei before entering the sea via Milnerton Lagoon. Particularly important in terms of avian ecology is a portion of Rietvlei that was declared a Protected Natural Environment in 1989 (IWQS 1997) and for which protected status as a RAMSAR site. While this area is considered a core site in the City of Cape Town’s Biodiversity Network (Laros 1994) it has nevertheless been subjected to various anthropogenic impacts including inputs of nutrient enriched water from Potsdam WWTW.

The main channel and tributaries of the Diep River, including the Mosselbank River, were described by Millard and Scott (1954) as naturally seasonal, experiencing spates of no flow between January, March and April. Intensive abstraction of water from the Diep River and its tributaries over recent years has however increased the extent of periods of no flow in the system compared to past conditions (Southern Waters 2000). This in turn has the potential to significantly impact the ecosystem health of downstream freshwater systems such as Rietvlei, which is heavily dependent on the highly seasonal hydrology and water quality of the Diep River (Southern Waters 2000).

From its source in the low hills of Kraaifontein, the Mosselbank River flows in a northerly direction, passing through residential and urban land use areas, particularly in its upper reaches and predominantly agricultural farmland and associated smallholdings in its lower reaches (Day 2003). Within the urban region of Kraaifontein, the river flows first through concrete canals and then through earth channels. Further downstream it is joined by a number of tributaries, including the Maasdrift canal (which receives treated effluent from the Kraaifontein sewage works) and the Klapmuts River (Day 2003), which flows through the western portion of the Drakenstein Municipal Area. Swinging westward, the river flows through agricultural land before entering the Diep River just east of Philadelphia.
Indigenous fish species in the Mosselbank River were likely to have included Cape kurper *Sandelia capensis*, Cape galaxias *Galaxias zebratus*, longfin eel *Anguila mossambica* and estuarine round herring *Gilchristella aestuaria* (Clark 2003), although these have been largely displaced from the main channels by alien species, notably mosquito fish *Gambusia affinis* and banded tilapia *Tilapia sparrmanii* (Clark 2003). The broader Mosselbank / Diep system is however considered of high conservation value in terms of freshwater fish due to the recent identification of genetically distinct populations of both Cape galaxias and Cape kurper, suggesting that these populations may in fact comprise distinct, probably endemic species (Comment from Dean Impson, CapeNature, in Day 2004).

A new WWTW at Fisantekraal is likely to result in further deterioration in downstream water quality and flow regime in the Mosselbank River, by converting the naturally seasonal system into a perennial one. Higher summer flows are exacerbated by surface runoff from the rapidly expanding urban areas in this region.

### 3.5.3 Molenaars / Breede River catchment

The Breede River Basin encompasses an area of some 12 600 km² which extends from the Skurweberge mountains near Ceres and the Langeberge Mountains in the north, to the Indian Ocean in the south. The Breede River itself enters the Indian Ocean at San Sebastian Bay just south of the town of Heidelberg. The greater Breede River basin can be subdivided into six sub-basins (DWAF 1999a). Of these, portions of the Upper Breede sub-basin (which extends along the Dwars River from Mitchell’s Pass to the Greater Brandvlei Dam near Worcester) are incorporated within the bounds of the Drakenstein Municipality. The rivers within the catchment that are included in the Drakenstein area are the Elands River, Molenaars River and the Krom River. Other tributaries feeding into the Upper Breede sub-basin include the Wit, Slanghoek, Jan du Toits and Holsloot Rivers.

Intensive agricultural landuse (predominantly vineyards and orchards) within the catchment is largely confined to areas adjacent to rivers and streams, or at the confluence of drainage systems. Brown and Fowler (2000) indicate that as a result of this, there is a general decline in the condition of rivers within the basin from mountain streams through foothill-cobble-bed river, foothill-gravel-bed rivers down to lowland rivers.

The Molenaars River, which rises in the Klein Drakenstein Mountains within the Drakenstein Municipal boundary, constitutes a relatively large portion of flow through the upper Breede sub-basin (Brown and Fowler 2000). The Molenaars River is fed by a number of smaller streams originating on the southern slopes of the Witteberg, the north-eastern slopes of the Klein Drakensteinberge, the northern Du Toitsberge (via the Tierstel River) and the south-eastern slopes of the Slanghoekberge. The Molenaars River eventually joins the Breede River just north of Rawsonville, some 1.5 km upstream of its confluence with the Jan Du Toit’s River.

The upper reaches of the Molenaars River, are relatively unimpacted and flow through naturally vegetated areas of the Du Toits Mountains, dominated by erosion-resistant sandstones. Runoff from the Du Kloof Lodge Trout Farm and the construction of additional trout and other resorts offer the main sources of impact to the Molenaars River in these upper reaches, along with invasion by alien vegetation and sedimentation as a result of erosion linked to clearing of alien vegetation.
3.6 Groundwater

Groundwater in the Berg River catchment is stored mainly in the Table Mountain Group and Malmesbury Group aquifers. The Table Mountain aquifer is the dominant aquifer in the upper catchment, while the Malmesbury Group Aquifer underlies most of the central and lower catchment. This groundwater does not exist in isolation and plays a vital role in ensuring the baseflow of rivers during the dry season.

The total harvest potential for the Berg River Basin is about 325 Mm$^3$.a$^{-1}$. High yielding aquifers are the Table Mountain Group Aquifer and one near Langebaan. Aquifers associated with the Malmesbury Group, Cape Granite Suite and Klipheuwel Group are considered to be of low harvesting potential.

Total groundwater use in the catchment is about 8.5 % of the harvest potential, with agriculture being the largest user. Most of the groundwater in the catchment is used in the western and southern parts, with little being used in the central region where dryland crops predominate. Poor groundwater quality, particularly in the Malmesbury Group Aquifer, and the availability of surface water supplies have limited the use of groundwater as a resource. It is essential that groundwater use does not result in the ecological collapse of surface waters, such as wetlands and rivers.

The Table Mountain Group Aquifer contains substantial supplies of groundwater. The City of Cape Town is investigating this groundwater resource for additional water supply in certain areas, for example the Watervalsberge near Voëlsvlei Dam, and portions of the Drakenstein River, upstream of the Wemmershoek Dam.
3.7 Water quality

A number of studies have focused on water quality assessments of the Berg River, the catchment comprising by far the largest area in the study area. Historically, water chemistry in this catchment has been described in terms of broad subdivisions or zones. Researchers have based their divisions on sub-regional zones e.g. mountain stream to lowland river zones (Harrison and Elsworth 1958), on the availability of water chemistry monitoring data (Bath 1993) and on the kinds of impact affecting the river in its different reaches (Fourie and Steer 1971). The latter approach offers the most useful means of assessing the river in terms of compilation of a management plan. Five zones were described by Fourie and Steer (1971) comprising of the following:

- The upper reaches of the river (Zone 1), from source to upstream of the Paarl sewage works, comprising naturally pure, slightly acidic waters. Note that since this work was carried out, this section of the river has been impacted by, the establishment (and recent closure) of a trout farm, past releases from the Theewaterskloof Tunnel and the new Berg River Dam.
- Zone 2, from the Paarl sewage works to downstream of Wellington: this zone is impacted by urban and industrial pollution from the two major urban areas within the Berg River catchment, including point source impacts in the form of effluent from the Paarl and Wellington waste water treatment facilities.
- Zone 3, which extends as far as immediately upstream of the Vöelvlei Dam outlet. Water quality in this zone is influenced by the underlying Malmesbury shales of this portion of the catchment.
- Zone 4, downstream of the Vöelvlei Dam, extending as far as the start of the tidal zone. The zone is influenced by outflows from Vöelvlei Dam, as well as by inflows from the seasonal tributaries that enter the river in this zone. These tributaries all flow over Malmesbury formations, and their water quality tends to be naturally more saline than that of the mainstream Berg River (Fourie and Steer 1971).
- Zone 5, the river in which tidal effects occur.

A recent study on the Berg River system, in Fourie and Steer ’s Zone 2 within the Drakenstein Municipal Area, revealed that the system is highly polluted and its water quality is significantly altered from its natural condition. The only portion of the catchment that is still in a near-pristine state is the upper catchment of the Twenty Four Rivers and the upper Klein Berg River (both upstream of the Drakenstein Municipal area boundary).

Water quality problems in the Berg River and its tributaries are the cumulative effect of pollutants from a variety of sources, including nutrient enrichment resulting from runoff from farmlands and golf courses, discharge of treated sewage effluent, pollutants from water runoff from informal settlements next to water sources, and storm water runoff. The contribution of toxic pollutants from sources such as crop sprays, cattle dips and industrial effluent is currently unknown (SoE 2005).

The various WWTWs in Paarl, Wellington, Pearl Valley Golf Estate, Drakenstein Prison, Gouda and Saron discharge effluent that generally meets the required standard in terms of bacterial counts. Nevertheless, there is significant faecal contamination of the Berg River, which can be attributed to stormwater runoff from informal settlements in the Paarl-Wellington area, and periodic overflows from the pump station at the Wellington WWTW. This poses a health risk for
contact recreation, such as swimming and canoeing (SoE 2005), while the irrigation of agricultural crops using sewage-contaminated water is also of concern from a health perspective.

The natural geology (shales) and agricultural return flows introduce elevated salinities in the middle and lower reaches of the Berg River, which impacts on industrial water use and on crop selection. Water in the Kompanpies River sometimes exceeds conductivity targets, while increasing sodium adsorption ratio (SAR) values on the Klein Berg River in summer indicate that soil salinisation may become a problem in future (SoE 2005).

3.8 Berg River Dam management and Inter-basin transfers

Prior to the construction of the Berg River Dam, summer releases were made from the Theewaterskloof Dam via the Riviersonderend (RSE) Tunnel into the Berg River at the Berg River Siphon for irrigators located further downstream the river. The magnitude of these releases has increased since the construction of the Theewaterskloof Dam in the 1980's and averaged about 48 Mm$^3$a$^{-1}$ just prior to the construction of the Berg River Dam. This is less than the volume allocated to the irrigators from the Theewaterskloof Dam of about 59 Mm$^3$a$^{-1}$. The irrigators have not expanded their irrigation to use the full allocation.

In theory, water from the Berg River Dam could now be released for these irrigators in summer, but it is more cost effective for this water to be used by the City of Cape Town because the water treatment costs are significantly less than treating water from the Theewaterskloof Dam. In practice, most of the irrigation releases will continue to be made mainly from the Theewaterskloof Dam using the pipeline connecting the Dasbos outlet to the supplement intake at the Wemmershoek River to avoid introducing a summer reversal of flow in the reach of river immediately downstream of the Berg River Dam down to the confluence with the Franschoek River. These releases from Theewaterskloof Dam will not be stored in the Berg River Dam to reduce the risk of contamination. Only under highly unlikely emergency situations (for example Theewaterskloof Dam wall or the RSE tunnel damaged in an earthquake) could transfers from Theewaterskloof Dam be stored in the Berg River Dam to ensure the security of water supply to Cape Town. The irrigators will receive an additional 16.5 Mm$^3$a$^{-1}$ corresponding to summer stream flows that they were entitled to use prior to the construction of the Berg River Dam. Most of this additional 16.5 Mm$^3$a$^{-1}$ will be released from the Berg River Dam itself as environmental compensation releases.

Several government water schemes are in place for transferring water between the Breede, Eerste, Riviersonderend and Berg River catchments respectively, while storage within the Berg and Breede river catchments is also augmented by various within-basin transfers. The Inter-basin transfer schemes discussed below are:

- Berg River Dam transfers
- Riviersonderend/ Berg River Government Water Supply Scheme
- Upper Breede Inter-basin transfer (White Bridge Diversion)
- Klein Berg Leeu River and Twenty Four Rivers diversion
- Wit River Inter-basin transfer
- Du Toits River Inter-basin Transfer
3.8.1 Berg River Dam management

The Berg River Dam will allow the following transfers:

- Pumping at rates of up to 4 – 5 m³.s⁻¹ from the Berg River supplement intake (downstream of the Banhoek River / Berg River confluence) into the Berg River Dam Basin (about 22 Mm³.a⁻¹).
- Transfers of up to 3 m³.s⁻¹ (maybe increasing to 6 m³.s⁻¹) from the Berg River Dam into the Theewaterskloof Dam.
- Transfers of up to 3 m³.s⁻¹ (maybe increasing to 6 m³.s⁻¹) from the Berg River Dam to the City of Cape Town Water Treatment Works. (These works located at Faure / Blackheath actually get their water via the RSE tunnel and the Kleinplaas Dam). In the future the water from the Berg River Dam may be piped to the City via another water treatment works which may be located at Muldersvlei. (This transfer could increase to about 80 Mm³.a⁻¹).

In addition to making releases for irrigators, Theewaterskloof also supplied up to about 1 m³.s⁻¹ via a pipeline from the Berg River Siphon to the Wemmershoek Water Treatment Works located downstream of the Wemmershoek Dam.

Managers of the Berg River Dam are also required to release environmental flows into the Berg River, in order to meet the Instream Flow Requirements of the river. These flow requirements are summarised in Ractliffe et al. (2008). This document stipulates the timing and magnitude of flow releases, from base flows to floods, from the Berg River Dam. Compliance with these requirements is an essential aspect of controlling the ecological and water quality impact of the Berg River Dam on downstream river reaches.

3.8.2 Riviersonderend/ Berg River Government Water Supply Scheme

The Riviersonderend/ Berg River Government Water Supply Scheme transfers water between the upper Berg, upper Riviersonderend (Theewaterskloof Dam) and Eerste River catchments through a series of tunnels. Water from this scheme is mainly used for urban supply as part of the Western Cape Water Supply System (WCWSS) and for irrigation in the Berg River catchment. The net export from the Breede WMA is 161 Mm³.a⁻¹, while about 25 Mm³.a⁻¹ is diverted from the upper Berg River into Theewaterskloof Dam. The tunnels transfer water as follows:

- Theewaterskloof Tunnel
- Banhoek Tunnel
- Wolwekloof Tunnel
- Jonkershoek Tunnel

Theewaterskloof Tunnel

Water for irrigation is released from Theewaterskloof Dam into the upper Berg River, upstream of Gauge G1H004, via the Theewaterskloof tunnel. Flow releases are gauged by station G1H044, which provides an up to date, monthly time series of releases into the Berg River since 1983. The estimated transfer volume is 41.7 Mm³.a⁻¹.

Banhoek Tunnel
In addition to the Wolwekloof tunnel, the Banhoek tunnel also diverts water from the Upper Berg catchment to Theewaterskloof Dam. The water is diverted from the Banhoek River, upstream of Gauge G1H019, and the diverted flow is recorded at station G1H063. This station also has a poor accuracy rating (DWAF 1993). The estimated diverted flow is 1.76 Mm$^3$a$^{-1}$.

**Wolwekloof Tunnel**
The Wolwekloof tunnel transfers water from the Wolwekloof River in the Upper Berg catchment at Gauge G1H038 to Theewaterskloof Dam. Although flow in the Wolwekloof tunnel is gauged at the tunnel inlets (G1H061), this station has a poor accuracy rating of zero (DWAF 1993) with the result that there is low confidence in the flow record (Mouski F, pers com 2007). It was assumed that there are no diversions into the tunnel during the summer months (October to March) and flows into the tunnel during the winter months are estimated based on recorded stage levels at Gauge G1H038. The estimated transfer volume is 21.6 Mm$^3$a$^{-1}$.

**Jonkershoek Tunnel**
The Jonkershoek tunnel diverts water from Theewaterskloof Dam via a tunnel under the Klein Drakenstein mountains to a balancing dam at Kleinplaas in the Jonkershoek River, from where water is tunnelled to the Faure Water Treatment Works. Kleinplaas Dam thus effectively acts as a balancing dam for the transfer of water from Theewaterskloof Dam to the Cape Town Basin.

**3.8.3 Upper Breede Inter-basin transfer (White Bridge Diversion)**
The White Bridge transfer scheme involves the diversion of water from the Upper Breede River (Breede WMA) to the Klein Berg River catchment (Berg WMA) via a canal, which diverts water immediately upstream of Gauge H1H006 in Michell’s Pass. The water is mainly used for irrigation in the Wolseley and Tulbagh areas and the annual volume is estimated to be 18.5 Mm$^3$a$^{-1}$. A portion of this water is abstracted from the canal and used for local irrigation in the Breede River catchment, before the canal crosses the watershed into the Klein Berg catchment. This abstraction is estimated to be about 12.2 Mm$^3$a$^{-1}$. This transfer is metered by DWAF at Gauge H1H022.

**3.8.4 Kleinberg Leeu River and Twenty Four Rivers diversion**
The Twenty Four Rivers canal conveys water that has been diverted from both the Twenty Four Rivers and Leeu River catchments to Vöelvlei Dam. The diversions are measured at flow gauges G1H058 and G1H059 respectively. The Klein Berg River canal diverts water from the Klein Berg River, a short distance downstream of Gauge G1H008, to Vöelvlei Dam. The flow records at these diversion structures are relatively inaccurate and contain considerable missing data with frequent exceedences of the rating curves. However, both canals are additionally gauged as they enter Vöelvlei Dam: Gauge G1H067 records flow in the Twenty Four Rivers Canal, while G1H066 records flow in the Klein Berg Canal. The quality of data from these two gauging stations is considered more reliable than those at the diversion structures. The estimated flow at G1H067 is 73.1 Mm$^3$a$^{-1}$ and at G1H066 is 28.1 Mm$^3$a$^{-1}$.

**3.8.5 Wit River Inter-basin transfer**
Since the mid 1800’s, water for irrigation purposes has been transferred from the Wit River, in the upper Breede WMA upstream of Gauge H1H007, to the Krom River in the Berg WMA upstream of Gauge G1H037, via a diversion scheme which became known as “Gowie se Water”. The BRBS presented an average figure of 4.9 Mm$^3$a$^{-1}$ for this diversion, which
corresponds to estimates by the Krom River Irrigation Board, which operates the scheme (VAFS 2001). The Krom River Irrigation Board indicated that the bulk of the water is diverted during the summer months. The water that is transferred is abstracted directly from the Krom River and is not stored in farm dams.

### 3.8.6 Du Toits River Inter-basin Transfer

Water is imported from the Du Toits River, upstream of Gauge H6H007 into the upper Rivieronderend catchment (Breede WMA), to supplement municipal use in Franschhoek (Berg WMA). As the volume of water which is transferred only equals about 0.16 Mm³, based on information supplied by the Stellenbosch Municipality, this transfer is considered to be insignificant.
Annexure 1: Constitution of South Africa (Relevant aspects)

As the point of departure for policy and law making in South Africa, the Constitution of the Republic of South Africa (Act 108 of 1996) includes far-reaching clauses relevant to the environment. In particular, the Bill of Rights stipulates that:

“Everyone has the right -

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development”.

Furthermore, the Bill of Rights provides for the constitutional right to have access to sufficient water. The Constitutional Court has reinforced this provision by reiterating the State’s obligation, at all levels, to take reasonable legislative and other measures within its available resources to achieve the progressive realization of this right.

Section 152 of the Constitution, together with Schedules 4 and 5, outline the objectives, powers and functions of national, provincial and local government. The objectives for local government are to:

- Provide democratic and accountable government for local communities;
- Ensure the provision of services to communities in a sustainable manner;
- Promote social and economic development;
- Promote a safe and healthy environment; and
- Encourage the involvement of communities and community organisations in the matters of local government.

Schedules 4B and 5B contain a total of 38 ‘local government matters’ which, under the subsections above, are the responsibility of local government. The following are of particular relevance to the management of riverine environments:

- Local tourism
- Municipal planning
- Municipal health services
- Storm water management in built up areas
- Water and sanitation services (limited to potable water supply systems and domestic waste-water and sewerage disposal systems)
- Cleansing
- Local amenities
- Municipal parks and recreation

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4 Section 27(1)(b)
• Public places
• Refuse removal, refuse dumps and solid waste removal.

Whether entrenched as a right to ensure environmental conservation and associated management or whether entrenched as a socio-economic right, the Constitution provides for the legislative foundation for the management of water resources, including rivers, in South Africa.
Annexure 2: Constitution of the Western Cape (Relevant aspects)
The Constitution of the Western Cape (Act 1 of 1998) has two major components dealing with environmental matters. Firstly the Constitution makes provision for the establishment of and principles governing a Commissioner for Environment (Section 71). Secondly, two of the directive principles of provincial policy (Section 81) relate to matters concerning the environment. The Western Cape government must adopt and implement policies to actively promote and maintain the welfare of the people of the Western Cape, including policies aimed at achieving the following:

- The protection of the environment in the Western Cape, including its unique fauna and flora, for the benefit of present and future generations; and
- The protection and conservation of the natural historical, cultural historical, archaeological and architectural heritage of the Western Cape for the benefit of the present and future generations.

The Constitution of the Western Cape provides provincial reinforcement of the sustainable management of natural resources such as rivers in the province, including at a municipal level.
Annexure 3: The National Environmental Management Act

The National Environmental Management Act (NEMA) (Act 107 of 1998) provides for co-operative environmental governance by establishing principles for decision making on matters effecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state, and to provide for matters connected thereto.

- Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- Development must be socially, environmentally and economically sustainable.
- Sustainable development requires the consideration of all relevant factors including the following:
  - That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
  - That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
  - That the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
  - That waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
  - That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
  - That the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;
  - That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
  - That negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.
- Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.

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5 As amended in terms of the National Environmental Management Amendment Act (No 8 of 2004).
• Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.

• Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.

• The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.

• Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge.

• Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.

• The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.

• The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.

• Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.

• There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment.

• Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.

• Global and international responsibilities relating to the environment must be discharged in the national interest.

Building on the above the NEMA aims to integrate the Act’s principles into environmental management by providing tools to facilitate its objectives. Section 23(2) provides the general objectives of integrated environmental, including:

• Identification, prediction and evaluation of actual and potential environmental impacts;

• Managing risks and consequences while considering alternatives and options for mitigation;

• Ensuring that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;

• Ensuring the consideration of environmental attributes in management and decision making; and

• Identification and employment of modes of environmental management best suited to ensuring that an activity is pursued in accordance with the principles of environmental management set out in section 2.
Annexure 4: National Environmental Management: Biodiversity Act

The Biodiversity Act (Act 10 of 2004) provides for the management and conservation of South Africa’s biodiversity, within the framework of NEMA, with a specific focus on the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources and the establishment and functions of a South African National Biodiversity Institute.

The National Environmental Management: Biodiversity Act applies to human activity affecting South Africa’s biological diversity and its components and binds all organs of state. The Act must be read with any applicable provisions of NEMA and must be guided by the National Environmental Management Principles.

Chapter 3 of the Act stipulates that a national biodiversity framework, a bioregional plan and a biodiversity management plan are required and that monitoring mechanisms and set indicators need to be designated in order to determine the conservation status of various components of South Africa’s biodiversity; and any negative and positive trends affecting the conservation status of the various components.
Annexure 5: National Environmental Management: Protected Areas Act

The purpose of the Protected Areas Act (No 57 of 2003) is to provide for the protection of ecologically viable areas, as well as for the establishment of a national register of all national, provincial and local protected areas and the management of these areas in accordance with national norms and standards.

In terms of the Act, protected areas comprise of the following:

- Special nature reserves, nature reserves (including wilderness areas) and protected environments;
- World heritage sites;
- Specially protected forest areas, forest nature reserves and forest wilderness areas declared in terms of the National Forests Act (No. 84 of 1998); and
- Mountain catchment areas declared in terms of the Mountain Catchment Areas Act (No 63 of 1970).

The Act provides for any land, including private or communal land, to be declared a formal protected area, and allows for co-management of such a protected area by the landowner(s) or any suitable person or organisation. This means that formal protected area status, with associated rates exclusion in terms of the Rates Act, is not limited to state-owned land, and that government agencies are not the only organisations that can manage protected areas.

The management authority assigned is required to prepare and submit a management plan (see Chapter 4 of Act).

In addition, in terms of the Act, indicators for monitoring performance with regard to the management of national protected areas and the conservation of biodiversity in those areas may be established by the Minister. This Act also deals with intergovernmental co-operation and public consultation in matters concerning protected areas.

The Act must be read with any applicable provisions of NEMA and be applied in accordance with the National Environmental Management Principles. In addition, the Act must, in relation to any protected area, be read, interpreted and applied in conjunction with the Biodiversity Act (Act 10 of 2004).
Annexure 6: National Heritage Resources Act

The purpose of the National Heritage Resources Act (NHRA) (No 25 of 1999) is to introduce an integrated and interactive system for the management of the national heritage resources in South Africa. The Act also serves to empower civil society to nurture and conserve their heritage resources so that they may be bequeathed to future generations, as well as to provide for the protection and management of conservation-worthy places and areas by local authorities. It enables the provinces to establish heritage authorities, which must adopt powers to protect and manage certain categories of heritage resources; and provides for the protection and management of conservation-worthy places and areas by local authorities.

In terms of Section 8 of the Act, there is a three-tier system for heritage resources management, in which national level functions are the responsibility of the South African Heritage Resources Agency (SAHRA), provincial level functions are the responsibility of provincial heritage resources authorities (i.e. in the Western Cape, Heritage Western Cape) and local level functions are the responsibility of local authorities. Heritage resources authorities and local authorities are therefore accountable for their actions and decisions and the performance of functions under this system.

Section 38(1) of the NHRA provides a list of development categories and stipulates that any person who intends to undertake a development as categorised must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority (i.e. SAHRA) and furnish it with details regarding the location, nature and extent of the proposed development. The responsible heritage resources authority would in turn indicate whether a Heritage Impact Assessment needs to be undertaken. The NHRA specifically excludes the need for an HIA where the evaluation of the impact of a development on heritage resources is required in terms of the ECA.

The Regulations of the NHRA provide the permit application procedures for any person wishing to undertake the activities listed in the regulations.
Annexure 7: Mountain Catchment Areas Act

The purpose of the Mountain Catchment Areas Act (No. 63 of 1970) is to provide for the conservation, use, management and control of land situated in mountain catchment areas. The Act empowers the Department of Water Affairs and Forestry to declare a mountain catchment area and to define its boundaries by notice in the Gazette. CapeNature’s legal responsibility to conserve the natural resources in mountain catchment areas is challenged by two major phenomena - namely the spread of uncontrolled wild fires and the proliferation of invasive alien plants.
Annexure 8: Conservation of Agricultural Resources Act

The aim of the Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983) is to control the over-utilisation of agricultural resources in order to promote the conservation of soil, water resources and vegetation, as well as combating invasive aliens. CARA is administered by the National Department of Agriculture.

The Minister may prescribe control measures applying to certain land users and areas. Such control measures are stipulated in Section 6(2) of the Act and include the following:

- the cultivation of virgin soil;
- the utilisation and protection of vleis; marshes; water sponges; water courses and water sources; and vegetation;
- the grazing capacity of the veld;
- the maximum number and kinds of animals that may be kept on veld;
- the prevention and control of veld fires;
- the utilisation and protection of veld that has burned; and
- the control of weeds and invader plants,

In terms of Section 7, control measures are also described for the prevention or control of water logging or salanization of land as well as the restoration or reclamation of eroded or disturbed land.

Amended Regulation 15 and 16 of CARA were promulgated in 2001. The Regulations make provision for four groups of classified problem plants. The first three groups consist of undesirable alien plants and are listed in Regulation 15, Table 3 and include Category 1 plants or declared weeds, Category 2 plant invaders (commercial value), category 3 plant invaders (ornamental value). The fourth group, which is covered in Regulation 16, are indicators of bush encroachment, and is relevant to landowners in rural areas.
Annexure 9: Municipal Systems Act

The Local Government Municipal Systems Act (No 32 of 2000) promotes the concepts of a developmental local government and a developmentally orientated process and makes statutory provision for municipalities to prepare spatial development frameworks (SDF) to form the basis of the Integrated Development Plan (IDP) process. During the compilation of SDFs and IDPs, a statutory review period is afforded all interested and affected parties to provide inputs into the draft documentation.
Annexure 10: Western Cape Nature Conservation Board Act

The Western Cape Nature Conservation Board Act (No 15 of 1998) provides for the establishment, powers, functions and funding of a Western Cape Nature Conservation Board and the establishment, funding and control of a Western Cape Nature Conservation Fund, and to provide for matters incidental thereto.

The Act makes provision for the establishment and composition of a Western Cape Nature Conservation Board, the objectives of which include:

- To promote and ensure nature conservation and related matters in the Province;
- To render services and provide facilities for research and training in connection with nature conservation and related matters in the Province; and
- In pursuing the above objectives, to generate income.

Section 17 of the Act provides for a performance audit, whereby ‘performance’ means all or any of the following:

- The extent to which the Board may or may not be complying or have complied with this Act;
- The extent to which the Board may or may not be using or have used its funds and assets efficiently and economically; and
- The extent to which the uses to which the Board is putting and has put its funds and assets may or may not benefit, or may or may not have benefited, nature conservation in the Province.

CapeNature is responsible for protecting a total area of 2,190,460 ha – which effectively puts it in charge of 18.4% of the surface area of the Western Cape. Of this extensive and often remote natural estate, 736,839 ha is directly protected under law. These formal Protected Areas constitute both Provincial Nature Reserves (Western Cape Nature Conservation Laws Amendment Act 3 of 2000) and Wilderness Areas (National Forest Act 84 of 1998). The Western Cape Nature Conservation Laws Amendment Act provides for the amendment of various laws on nature conservation in order to transfer administration of the provisions of those laws to the Western Cape Nature Conservation Board.
Annexure 11: Western Cape Land Use Planning Ordinance

In terms of Section 18 (1) of the Land Use Planning Ordinance (Ordinance 15 of 1985), if a site selected for a particular development is within an area in which the Municipality is authorised by a Structure Plan to approve such a rezoning it may do so, provided that the necessary procedures (including receiving comments from adjacent property owners/managers such as CapeNature) are complied with. If the site does not fall within such an area, the rezoning will have to be approved by the Department of Environment Affairs and Development Planning of the Western Cape Provincial Government.
Annexure 12: Convention on Biological Diversity

The Convention on Biological Diversity (CBD) was signed by South Africa in June 1993 and ratified on 2 November 1995. This was the first global agreement on the conservation and sustainable use of biological diversity. The Convention aims to conserve biological diversity; to promote sustainable use of living natural resources worldwide; and the fair and equitable sharing of benefits arising out of the utilisation of genetic resources. It also promotes the following:

- Protection of ecosystems, habitats and species;
- Sustainable use of wetlands;
- Rehabilitation of degraded ecosystems; and
- An ecosystem approach.

The Convention is a framework treaty in two senses; first in that its provisions are generally expressed as overall goals and policies rather than precise obligations and secondly, and more specifically, it adopts an holistic approach by not setting targets or including lists of species or areas to be protected, but sets out general rights and obligations.

While recognising that the conservation of biodiversity is a ‘common concern’ of humankind, it emphasises the fact that natural resources are the property of individual countries. It ties this right to a national responsibility for environmental conservation, placing most decision-making at the national level.

The objectives of the Convention are to be achieved in a variety of ways. First, Article 6 provides for General Measures for Conservation and Sustainable Use and requires contracting parties to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity and to integrate these as far as possible into relevant sectoral programmes and policies. Secondly, specific articles provide for in-situ conservation and ex-situ conservation respectively. Thirdly, a series of articles sets out a regulatory regime ensuring access to genetic resources by importing countries while providing for various returns to exporting countries in the form of transfer of technology, research methodology etc.

A Strategic Plan for the CBD was developed by the Parties in 2002 in order to guide its further implementation at the national, regional and global levels. The Strategic Plan promotes broad-based action by bringing about a convergence of actions around agreed goals and collective objectives. These include the following:

- The Convention is fulfilling its leadership role in international biodiversity issues.
- Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention.
- National biodiversity strategies and action plans and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the Convention.
- There is a better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.

As a signatory of the CBD, South Africa has committed itself to the goals and requirements as outlined in the agreement. Many of the key pieces of South African biodiversity legislation, e.g.
National Environmental Management Biodiversity and Protected Areas Acts are underpinned by the philosophies and objectives of the CBD. In the legal audit undertaken for the purposes of this project (see Annexure A) only relevant national acts and ordinances have therefore been focussed on.
Annexure 13: Convention on Wetlands of International Importance

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (known as the Ramsar Convention) was signed by South Africa in March 1975 and ratified on 12 March 1975. The provisions of this Convention are precise obligations and promote the following principles:

- The conservation of listed wetlands;
- The wise (sustainable) use of wetlands;
- International co-operation; and
- The creation of wetland reserves.
Annexure 14: Strategic Environmental Assessment (SEA) overview

A Strategic Environmental Assessment was commissioned by the Drakenstein Municipality as part of the process for the preparation of this Spatial Development Framework. The overall objective of the Drakenstein SDF is to provide a vision and framework for land use management and potential development in the Drakenstein Municipality. The SEA aims to provide that vision and framework from an environmental perspective, amongst others by identifying areas of significance for conservation and development and assessing all in relation to the others, to determine where development, rather than conservation (or the opposite) should occur, what type of development should receive priority in which area, etc. It must ensure that environmental issues are addressed in the initial stages of the planning process and provide baseline information in identifying opportunities as well as constraints.

In keeping with the framework and objectives of the SEA, the need for developable land must be seen in relation to the value of the land for other functions and uses. The assessment completed as part of the SEA indicates that the urban industrial sector is the most significant employment sector, followed by intensive agriculture and tourism, both of which rely on the natural environment. It therefore follows that the natural environment and the intensive agricultural sector should receive as much prominence in decision making related to development and conservation as the need for housing land.

Paarl and Surrounding Areas

The main focus areas for conservation of the natural environment are the core sites that coincide with the Renosterveld habitat and the mountain ranges along the eastern boundary of the region (Figure 1). Most of the land in the southwest and western part of the Drakenstein region, especially to the west of Paarl Mountain, is commercially cultivated dry or irrigated land. The biodiversity of this area is very low and it is used predominantly for wheat cultivation, which has limited employment opportunities relative to the extent of land required. Therefore, the western areas of the Paarl-Wellington sub-region are more desirable for consideration of locations for future housing, commercial or industrial development.

To the east of Paarl, towards the Drakenstein Mountains, housing developments have started to develop more towards the mountains and the core conservation areas. The areas across Jan van Riebeeck Road from Newtown and Mbekweni have already been set aside for subsidized housing development and Smartietown already falls within this growth area. Possible future developable areas include areas south of the N1 as well as areas southeast of Paarl Mountain.

To the east and southeast of Smartietown and Mbekweni, the land use changes to intensive agriculture, which is a major employment sector. Most of the agricultural area to the east of Paarl and Wellington, along the foot of the Drakenstein Mountains, is used for intensive agricultural production. It includes export and wine vineyards, irrigated grazing, intensive feed farming, intensive plant production (tunnel farming) and forestry. These established farms should serve as a barrier between the growing urban area (Mbekweni, Smartietown and Newtown) and the core conservation areas, while simultaneously receiving protection for its employment and economic value. Examples of established farms include the vineyards of the well-known Nederburg, which lies to the south of Smartietown. Nederburg is one of South Africa’s leading and most decorated wineries and winner of more international and domestic awards than any other in South Africa. The land was acquired in 1791 and the founder of Nederburg, Philippus Wolvaart, built the Cape Dutch gable homestead in 1800. The Nederburg homestead is also a South African National Monument. It thus follows that the area also has...
unique tourism potential, which is the next most important economic sector in the region. A further barrier to the south east is the correctional facility, the Allandale Correctional Centre.

The same applies to the areas to the west of Newtown and Mbekweni. The established cultivated land on the edge of Paarl Mountain can also serve as a barrier in order to protect the biodiversity and feature value of Paarl Mountain.

Figure 1: Proposed future development and conservation corridors

Not related to the need for subsidized housing, but related by virtue of its nature, a new development, the Diemersfontein Wine & Country Estate, launched their first range of red wines in 2001 and their Pinotage received many accolades. This Estate also offers dining, wedding
and conference facilities along with its “Vineyard Properties” venture, which is urban development in a rural environment. This new venture offers investors smallholdings for permanent residence with views of Du Toit’s Kloof, Bain’s Kloof and Kasteelberg surrounded by vineyard owned individually but farmed communally. The price of these smallholdings, depending on their location, range from R550 000,00 to R850 000,00 (May 2004). It makes this an exclusive estate and a barrier for future subsidized housing developments, however it sets a trend for the degradation of the intensive farming sector, as the value of the development allows for the acquisition of productive wine and other intensively cultivated farms that would otherwise have been fully used for agricultural or land reform purposes. The same is not true in the case of subsidized housing development, i.e. it does not increase the value of the land significantly and it does not create a barrier to future development.

Estates such as these where investors use large amounts of money to develop erven surrounded by vineyards, should be seen as an urban edge use and a barrier / buffer between the vulnerable core conservation sites, buffers and intensive agricultural use on the one hand and general urban expansion on the other.

The land use and the agricultural potential of the land to the south of the N1, along the eastern side of the Berg River and up to the R303 and the adjoining land to the east, generally allows for further development without detracting from the economic or ecological resources of the region. Agriculture uses up to 30% of the available water resources of the region. The equivalent water supply to urban uses should be the limiting factor in development. Thus, mixed use neighbourhoods and nodes of development using alternative technologies and systems could probably be established in a sustainable manner, as long as new servicing systems, recycling and efficient land use are the main elements of the development.

Wellington and Surrounding Areas

As in the case of Paarl, most of the land surrounding Wellington, especially to the north and west, is used mainly for agriculture. Even though most of the areas towards northeast and east of Wellington are used for agriculture, the Groenberg area has a relative high biodiversity value level (60-65%). The Groenberg and its foot should thus be seen as a ‘no go’ zone for all forms of development. Farms surrounding this mountain should be used as a buffer or transition zone, while limiting the expansion of agricultural activities up the mountain slopes, where some habitat destruction has already occurred.

Different types of agriculture are found along the Limietberg Mountain, from Bain’s Kloof to Du Toit’s Kloof. In order to preserve the biodiversity of the Limietberg and Drakenstein Mountains, strict regulation of the situation would be required and policies have to be determined for agriculture abutting Spatial Planning Categories A and B (core and buffer areas). These farms should not be permitted to use land higher and higher into the mountain. Extensions of agriculture degrade the core conservation and buffer areas and detract from the visual quality of the area and thus the biodiversity value and tourism attraction, which probably outweighs the agricultural value that would result from such extensions, without requiring additional water.

The possible areas available for future development fall either southwest or southeast of Wellington, where these development areas are not in conflict with the conservation focus of the SEA. However, from the economic perspective, no development should occur to the southeast. The cost of the loss of productive agricultural land (and job opportunities) together with the limitations in the services systems, dictate that development should occur to the south west.
The Western Cape Nature Conservation Board (WCNCB) has also identified the Groenberg area as a possible area for the establishment of conservation stewardship projects, which further substantiates the environmental and conservation significance of the area. The WCNCB pilot project area extends along the Limietberg range towards Hermon and the Elandskloof Mountain.

**Hermon, Voëlvlei and Environs**

Other than the mountain ranges and along the banks of streams and rivers, virtually all the land in this northern part of the region has been cultivated. Wheat production is the primary agricultural activity in this area. The farm Bartholomeusklip, at the foot of the Elandskloof Mountains northeast of Hermon, is a key focus area for a research project into the restoration of Renosterveld. Amongst others, it tries to establish whether natural vegetation could recover more rapidly on abandoned fields with suitable management. This project is known as the Renosterveld Restoration Project. A private nature reserve was initially established on the farm in 1973 to save the endangered geometric tortoise, Psammobates geometricus. Not only does Bartholomeusklip stock a number of game species such as eland, red hartebeest, plains zebra and bontebok, but it also houses one of the largest remaining patches of West Coast Renosterveld (1 600ha). It is within the identified core area, as it includes a large area of land on the lowlands, as opposed to the other core areas that occur predominantly on the mountains. Farms with declared reserves such as this, especially if included in a conservation stewardship program, form the perfect barrier against urban development and maintain the natural environment, since the biodiversity value levels are high.

The towns of Hermon and Gouda are also under pressure for development. Both are dormitories for the surrounding agricultural areas. Farm labourers commute from these towns to surrounding farms as and when needed. To the east of Hermon is the high security Kranzkop factory of Denel, adjacent to which is a high bio-security intensive chicken farm of the County Fair group. As this farm includes a breeding stock facility and hatchery, it is important to maintain a development buffer of more than 1 000m around it. At present it is surrounded by cultivated fields. Both these facilities offer employment opportunities dependent on commuting. Due to their nature, they also offer opportunities for the restoration of natural vegetation in their security buffers.

The aim of the Drakenstein Municipality SDF and SEA is to provide a vision for sustainable development and a framework for land use management in the Drakenstein Municipality from an environmental perspective. In order to achieve this, it is essential to ensure the following:

- That biodiversity networks and corridors are established, delineated and mapped and that management plans are prepared for these corridors;
- That natural features and the attraction of the area, with special reference to the aesthetics thereof, be protected;
- That the heritage resources of the Drakenstein Municipality be protected, and that the heritage resources also include the natural heritage, not only the built environment, as the context within which the built environment was established is as important as the buildings;
- That nature conservation and recreation opportunities be established in a complementary manner, allowing for the maximum access to conservation areas;
That the soil and the agricultural potential of the area be protected; and

That the water resources of the municipality be given maximum protection in order to ensure the system as a potable resource, for irrigation and for recreation purposes.

Relative environmental value elements

The first stage strategic environmental assessment of the Drakenstein Municipal area presents a clear indication of the relative value of the most significant environmental assets. It is essential to consider the relative values when deciding on land use changes and development proposals, in order to achieve the goals of the SEA. Decision-makers and officials must act accordingly, i.e. implement the proposals to ensure the sustainable protection of the environmental integrity of the area, the well-being of all residents and to promote economic efficiency in all land use management.

Definable core conservation areas exist for the conservation of the natural environment that supports the existence of a unique mix of plant species, described as the Fynbos Biome of the Cape Floral Kingdom, which is one of the main attractions of the Western Cape from a tourism perspective. Due to the limited extent of the Renosterveld within this biome, it should as a matter of priority be preserved and no form of development or modification of the environment should be permitted, to prevent further erosion of this habitat. The critically endangered and endangered vegetation types such as Swartland Silcrete Renosterveld, Boland Granite Fynbos and Swartland Alluvium Fynbos, found in the proposed core conservation areas along and abutting the mountain ranges must be highlighted in the Spatial Development Framework as Core and Buffer areas, as defined in the Spatial Planning Categories (SPC’s). The Core and Buffer areas (SPC’s A.a, A.b, B.a, B.b and B.c) would then cover the suggested corridors and land indicated as core sites, critical habitats and clusters of core sites in the SEA map.

Additional areas for consideration for conservation and the establishment of biodiversity corridors should include Saron and surrounding areas (Breede Shale Renosterveld, Swartland Shale Renosterveld and Swartland Alluvium Fynbos), Hermon (Atlantis Sand Fynbos), the Limietberg Nature Reserve and the Joostenberg Private Nature Reserve (Swartland Shale Renosterveld, Swartland Alluvium Fynbos and Swartland Silcrete Renosterveld).

High intensity agriculture occurs around the major urban areas, where most pressure for development occurs, leading to a conflict in needs, i.e. the need to retain the economic integrity of the agricultural sector or to provide land for needed urban expansion in the form of low income subsidized housing. There are areas of low intensity agricultural activity in the vicinity of these pressured urban areas, where new development could be considered, albeit with leapfrog development. It is therefore essential that new nodes be established for development in areas of low agricultural activity and environmental value. Simultaneously new methods of land use (higher density and intensity) should be established in existing nodes where the services systems allow for or could feasibly be upgraded for development.

In view of the above, the SEA recommends that:

- Housing development with the highest priority on social housing (subsidy housing with all the related social facilities, such as schools, education and skills training centres, health centres, community facilities and lower order (neighbourhood level) economic activities) be established as one of the high value environmental elements;
Overview of the study area

- Industrial and manufacturing activity be promoted through the relaxation of land use restrictions and reduction of municipal levies and costs related to the development of industrial land;

- High intensity and relatively high potential agricultural resources (land, farms, water sources, soil and infrastructure) be conserved and protected from modification as one of the high value environmental elements;

- The indicated core areas of high biodiversity value be protected from all forms of modification and development, through the establishment of conservation policies and biodiversity management plans;

- Suitable areas of transition and biodiversity corridors be established around and between the core areas, as biodiversity buffers and habitat links;

- All environmental modification (change in land use, i.e. use of the land for whatever purpose) in Spatial Planning Category A areas be subject to a full Strategic Environmental Assessment and all modification in a Category B areas be subject to a full Environmental Impact Assessment (all stages of the EIA process);

- Biodiversity corridors be establishment along all wetlands (rivers, streams and vlei areas) and that biodiversity and corridor management plans be introduced for the management of the corridors;

- Priority be given to the development of under-utilised land and vacant areas in the urban areas, rather than development along the urban edges;

- New high density and high intensity mixed use settlements be established in areas of low environmental significance rather than permitting expansion into areas of transition around the core areas of conservation, biodiversity corridors or in areas of high intensity agriculture and relatively high agricultural potential;

- New servicing systems, e.g. water saving toilets, composting toilets and urine separating toilets, be used in all new settlements and in redevelopment areas in existing nodes, in order to reduce the average water consumption of users and to limit wastewater flows;

- The process of degradation and species loss through human activity (primarily agriculture and urban development) must be halted by the preparation of biodiversity management plans for the proposed biodiversity corridors that are highlighted as priority areas for conservation. The proposed biodiversity corridors and biodiversity corridor management plans must be submitted to as an input to the MEC for Environmental Affairs for inclusion in the Bioregional Plan;

- A detailed assessment of the proposed biodiversity corridors must be done to determine what species could be protected through the biodiversity corridors and a Biodiversity Corridor Management Plan must be prepared for each corridor or the corridors as a whole and presented to the MEC in keeping with the requirements of the relevant Act; and

- River corridors be defined as all land within the 1:100 year flood line of the stream or river and where the 1:100 year flood line occurs on or in close proximity of the riparian area (on the river banks), a distance of not less than 50 m from the edge of the water in the stream or river (i.e. from the edge of the marginal habitat).
Natural resource conservation

The Drakenstein Spatial Development Framework has included both critically endangered and endangered habitat in the CORE (A) spatial planning category in order to safeguard the remaining threatened habitat that retains an important connection to this mountain range. The inclusion of endangered habitat in the CORE (A) category also provides an opportunity to protect two the large areas of remaining critically endangered and endangered natural habitat that form Paardeberg and Paarl Mountain.

All terrestrial threatened ecosystems in the municipality (critically endangered and endangered natural habitat) have been afforded the protection of the CORE (A) category and have been included in Spatial Planning Category A.b. No vulnerable natural habitat occurs within the municipality.

Threatened ecosystems in the municipality occur mostly along the lower slopes of the north-south range of mountains, which form the eastern boundary of the municipality. This range of mountains contains large areas of contiguous natural habitat and protected areas. It has been identified as an important ecological corridor contributing to the regional persistence of biodiversity in the draft Western Cape Provincial Spatial Development Framework proposal.

An important management guideline is that when loss of natural habitat is unavoidable, it is important to minimize fragmentation wherever possible (for example by clustering development and avoiding sprawl). Also, it is far more costly to manage disturbed ecosystems than intact ones. Land use pressures can result in ad hoc transformation of effectively healthy habitat, and through fragmentation, progressively reduce its ability to function and maintain itself naturally, ultimately imposing a burden on society and the state by requiring formal conservation intervention – or loss of critical ecological goods and services.

Key considerations that can contribute to the conservation of biodiversity:

- Support connections between remaining natural habitat;
- Support connections between critically endangered or endangered vegetation and large, intact areas of natural vegetation;
- Include the full diversity of natural habitats and species;
- Include areas that contribute to the regional persistence of biodiversity.

Spatial Planning Category (SPC) A.a: Protected Areas

Protected areas are represented in Figure 2. The system of protected areas in the municipality currently includes:

- Local Authority Nature Reserve – Paarl Mountain
- Contract Nature Reserve – Elandsberg
- Mountain Catchment Area – Hawequas and
- Provincial Nature Reserves (all or portions of the following):
  - Hawequas Provincial Nature Reserve
  - Groenbbag Provincial Nature Reserve
Overview of the study area

- Waterval Provincial Nature Reserve
- Groot Winterhoek Provincial Nature Reserve
- Jan Briers Louw Provincial Nature Reserve
- Simonsberg Provincial Nature Reserve

Provincial Nature Reserves and Hawthos Mountain Catchment Area are managed and owned by CapeNature. Contract Nature Reserves are legally binding contracts between CapeNature and a landowner for the protection of these habitats in the long term. They are valid in perpetuity or a minimum of 50 years (negotiated on a case by case basis). Private ownership of the property is not compromised or transferred by this agreement and the Contract Nature Reserve enjoys the same status as a Provincial Nature Reserve under the Protected Areas Act, 2003 (Act 57 of 2003).
Overview of the study area

Figure 2 Broad-Brush Overall SDF Bioregional Planning Concept
Policy: SPC A.a

With the exception of Paarl Mountain Nature Reserve, any land use in Spatial Planning Category A.a areas is subject to the provisions of the Protected Areas Act, 2003.

Spatial Planning Category (SPC) A.b: Priority natural habitat

Priority natural habitat within the municipality is represented in Figure 2, including:

- Critically endangered natural habitat
- Endangered natural habitat
- Wetlands
- Silcrete patches

These areas are based on the best available information, and include:

- Critically endangered and endangered ecosystems identified in the National Spatial Biodiversity Assessment (SANBI 2004) and the Cape Lowlands Renosterveld fine-scale conservation plan (Botanical Society Conservation Unit 2003),
- Available wetlands information from CapeNature,
- Mapping of silcrete patches from the Cape Lowlands Renosterveld fine-scale conservation plan (Botanical Society Conservation Unit 2003)

In the event of a development application, those areas within the municipality where Spatial Planning Category A.b applies should be confirmed through:

- Reference to the spatial planning categories map (Figure 2), in conjunction with
- A site visit to verify the presence of features meeting the category description
- Any natural habitat meeting the criteria for this category that is found during a site visit even if it is not currently mapped on Figure 2.

Policy: SPC A.b

In critically endangered and endangered ecosystems and silcrete patches

- No further loss of natural habitat

In wetland ecosystems

- No earthmoving, construction, flood control measures or intensive agriculture within a wetland, or within at least 30 meters\(^7\) of a wetland, measured from the wetland boundary. (Note that a wetland boundary must be delineated by a specialist, based on a Department of Water Affairs and Forestry accepted method)

\(^{7}\) The “buffer” may need to be wider than 30 meters. This should further be determined on a case by case basis by a specialist ecologist in consultation with the Department of Water Affairs and Forestry (DWAF) and CapeNature to reflect site-specific factors. The approach for determining buffer width should consider the class of the ecosystem (per DWAF classification system), plus an assessment of the impacts to the ecosystem of the of the existing and proposed adjacent land use. It should incorporate an understanding of the current condition of the aquatic ecosystem and existing and proposed buffer, as well as the functioning of the system in the broader landscape.
Appropriate land use
Appropriate land uses are activities that do not result in further loss of habitat or disturbance to ecosystems functioning in these systems. Appropriate land uses may include:

- Passive recreation and tourism (hiking trails, bird watching)
- Research
- Environmental education


Spatial Planning Category A.b - Biodiversity priorities in specific areas
For the purposes of this spatial planning exercise, the municipality is broadly divided into:

- South of Paarl
- West of Paarl Mountain
- Paarl Mountain
- Paarl, Mbekweni and Wellington
- Wellington to Hermon
- Hermon to Gouda
- Gouda to Saron

Area south of the N1
This includes the area within the municipality east of the R44 and south of the N1.

Current land use: predominantly agriculture with low density residential development
Current zoning: predominantly agriculture

Identified pressures to biodiversity within the next five years:

- Agricultural and urban expansion
- Alien vegetation.

Biodiversity priorities:

- The Berg River is an important corridor through this section. In places, small patches of critically endangered vegetation are mapped along the river corridor.

Recommend maintain natural vegetation buffer and priorities clearing of alien vegetation. For the Berg River priorities alien clearing.

- A large area of critically endangered vegetation occurs in the Pearl Valley project vicinity.

Recommend maintaining corridor connecting this habitat to the protected habitat of the Drakenstein Mountains.

- Patches of critically endangered and endangered habitat occur immediately adjacent to protected areas of the Drakenstein Mountains.
Recommend maintaining the interface between threatened habitats and protected areas as well as between different vegetation types. Link the remaining critically endangered lowland habitat to the protected mountain area of the Hawequas Provincial Nature Reserve.

- SAFCOL site and adjacent private plantations to the south (Hawequas State Forest) support the bulk of the remaining population of the Critically Endangered Diastella buekii (Proteaceae).

**Recommend** low impact harvesting of the SAFCOL plantations, under strict supervision of an Environmental Control Officer. Primary concern in this area is to limit vehicle movement to specific corridors where the Diastella does not occur.

**Opportunity** exists to preserve the remaining endangered habitat adjacent to Simonsberg, forming a corridor extending into Stellenbosch municipality. Of specific importance are the Shale Renosterveld and Shale Fynbos on the northwest slopes of the Simonsberg, particularly on the farm Lievland (Wiesenhof) and Signal Hill 965.

**Recommend** smaller patches in this area should be approached in terms of the general principles for dealing with critically endangered habitat as detailed in this SDF.

**West of Paarl Mountain, including Paardeberg**

This includes the area within the municipality west of Paarl Mountain, bounded by the N1 to the south and the R45 to the north.

**Current land use:** predominantly agriculture

**Current zoning:** predominantly agriculture

**Identified pressures to biodiversity within the next five years:**

- 4 x 4 trails
- Frequent fires
- Vineyard expansions
- Alien vegetation.

**Biodiversity priorities:**

- Several fragments occur in south-western corner including one relatively large one in Jan Briers Louw Provincial Nature Reserve. Highlight as a priority area. Other important remnants 3km north of Jan Briers Louw PNR include fairly large patches of Renosterveld on Kuilenberg farm. Conserving this habitat and keeping it free of alien vegetation will immeasurably add to the viability of the remaining vegetation within the Reserve. Some potential also exists in this area to link to the City of Cape Town’s Biodiversity Network – an open space network that runs throughout the metropolitan area.

**Opportunity** exists in several fragments on private land (and corporate owned) in south-western corner potential to link to Jan Briers Louw Provincial Nature Reserve and City of Cape Town Biodiversity Network (Joostenberg Hill and Joostenberg Kloof, outside of municipality). Encourage the linking of several fragments in south-western corner to City of Cape Town Biodiversity Network.
• Series of rare shale wetlands in the central section near Boland Agricultural College on the Sandrivier tributaries. Wetlands are an important component of the catchment. Initiatives are underway to inventory and classify the wetlands of the Western Cape.

• Endangered Boland granite fynbos on the slopes of Paardeberg. To the west of this is Paardeberg. Threatened by encroaching resort development, set a contour, no development above certain line. Issues include vineyards, 4 by four trails, aliens resort development. Most critical areas are the lower slopes where very little natural habitat remains, and which support a different plant community to that on the slopes. Key patches in this regard are actually within Swartland Municipal area – e.g. Lemoenkloof, Vlakfontein, Morgenwagt (Woodlands 874), and De Hoop.

Recommend work together with adjacent municipality to protect this important area. No development on the slopes of Paardeberg above a certain elevation, although as noted the key areas are the lower slopes where the upland – lowland interface occurs. Paardeberg is already a conservancy and NHS. Tourism opportunities exist including canon with historical value.

• Smaller patches in this area should be approached in terms of the general principles for dealing with critically endangered habitat as detailed in this SDF.

Paarl Mountain
This includes Paarl Mountain Local Nature Reserve and the agricultural and residential areas on its slopes.

Current land use: predominantly green open space with agriculture

Current zoning: predominantly open space I

Identified pressures to biodiversity within the next five years:

• Alien vegetation
• Agricultural expansion
• Poaching
• Frequent fires (or unnaturally long periods between fires due to agricultural fragmentation and landowner unwillingness to allow veld to burn).

Biodiversity priorities:

• Paarl Mountain contains predominantly endangered Boland granite fynbos flanked on the lower lying slopes with critically endangered Granite and Shale xx renosterveld. Upland lowland gradients, Upland lowland interface (lots), Granite forests. A recent vegetation survey and a management plan have been completed for the mountain.

Opportunities include working with CapeNature to expand the protected area. The major part of mountain is already part of LANR. Tourism opportunities abound including an established wine route and the Taal Monument.

• An area-wide planning initiative is currently underway.
Paarl, Mbekweni and Wellington
This includes the three major urban areas in the municipality and their immediate surrounds, as well as all land to the east of these towns.

Current land use: predominantly urban related uses
Current zoning: predominantly residential and other urban related zonings

Identified pressures to biodiversity within the next five years:

- The Krom and Hugos Rivers are severely infested with black wattle, poplars, spanish reed, river gum and longleaf wattle. This has reduced river flow, caused incised channels and destabilized river banks. Straightening and stabilization of river channels has reduced habitat diversity and aquatic species diversity.

Biodiversity priorities:

- New Orleans Park (camping and picnic site) is a local priority area with a significant patch of Shale Renosterveld which is the only known locality of the Critically Endangered daisy Marasmodes undulata, and various other very rare species.

**Recommend** incorporation into Paarl green space network and manage Renosterveld according to an approved conservation management plan, with no further transformation and no expansion of lawns.

- Remnants along Berg River.

**Recommend** clear alien vegetation from riparian zone of rivers, maintain a buffer of at least 30m next to the river, improve management and monitoring of stormwater quality in urban areas.

- Further investigation is required regarding remnants adjacent to Mbekweni.

- Patch of renosterveld adjacent to the industrial area to the west of Wellington.

**Recommend** clear alien vegetation.

Wellington to Hermon
This includes all land north of Wellington up to and including Hermon.

Current land use: predominantly agriculture
Current zoning: predominantly agriculture

Identified pressures to biodiversity within the next five years:

- Agtergroenberg - Alien grasses, veld fires, alien pigs, small scale farming initiatives being planned

- adjacent to Klein Drakenstein mountains - Alien vegetation, fires, area potential for intensive buchu poaching.

Biodiversity priorities:

- Groenengberg Provincial Nature Reserve is small area surrounded by endangered and critically endangered habitat in private hands. Maintain resource to have such a large area, with unbroken links to larger protected mountain areas.
- Support LandCare – several stewardship projects underway.
- Farm expansion pressure onto natural vegetation pressure in this area.

**Recommend** make every effort to maintain the corridor extending north – areas such as these support many interactions both between vegetation types (renosterveld and fynbos) and the higher mountainous areas to the lower-lying areas as well as movement along the contour line.

**Hermon to Gouda**

This includes all land north of Hermon up to and including Gouda.

Current land use: predominantly agriculture

Current zoning: predominantly agriculture

Identified pressures to biodiversity within the next five years:

- None

Biodiversity priorities:

- Very large area of commonage. One corner has a patch of critically endangered vegetation. Again, maintain link between this and larger, protected area.
- An important Shale Renosterveld wetland area exists between railway and canal south of Hermon, east of main road to Hermon.
- Similarly, very important remaining habitat continues north.

**Recommend** to develop a good management plan to manage alien vegetation.

**Gouda to Saron**

This includes all land north of Gouda up to and including Saron.

Current land use: predominantly agriculture

Current zoning: predominantly agriculture

Identified pressures to biodiversity within the next five years:

- Overgrazing
- Fires
- Alien plants
- Site used as rubbish dump
- Sand-mining
- Canal
- Variety of demands on land
- Area burnt for grazing
- Impact of agricultural activities on wetland west of Saron
- River and flow modification – diversion weirs on the Klein Berg and Twenty-four rivers greatly reduce river health. Inappropriate farming practices along the river banks have resulted in the need to construct levees to prevent flood damage. Levees intensify flood flow, reduce the natural ability of the floodplain to absorb flood water and result in
increased levels of siltation downstream. Lower reaches of Klein Berg and mainstream Berg river are infested with alien vegetation.

- Other threats include urban and agricultural development. Alien fish (carp, sharptooth catfish, smallmouth bass, Mozambique tilapia and rainbow trout) have caused the localized extinction of the Berg River redfin, Cape kurper and witvis.

Biodiversity priorities:

- Large commonage presents major potential to protect remaining renosterveld. Ways to add some form of protection include a management plan to remove aliens, conservancy agreement etc. Upland lowland gradient, Upland lowland interface, edaphic interface, wetlands, geometric tortoises.

Opportunities include tourism potential (hiking trails). Area wide planning underway for the area adjacent to Grootwinterhoek.

- The four important areas in the Saron area are:
  o Wetland (ephemeral pan – highly threatened habitat on the West Coast) – rare species including, Lachenalia bachmanii (one of only three known locations), Oxalis natans. **Recommend** fence off wetland area to prevent impact from livestock, impacts to wetland on other side of road may alter hydrology of this wetland.
  o Koppie area (ferricrete overlying Malmesbury shale), geometric tortoise habitat – diverse plant species but impacted by livestock grazing. **Recommend** burn, exclude livestock, clear Port Jackson
  o Colluvial terrace above canal important renosterveld mosaic, adjacent to mountain habitat, old quarry and sand mine, scattered alien veg, dense alien veg along river
  o Colluvial terrace below canal acidic veld with few palatable grasses thus currently not severely impacted **Recommend** guidelines for use as grazing area

Berg River and tributaries

**Recommend** ensure environmental flow releases are made from diversion weirs such as on the Twenty-four River (RHP), continue clearing of invasive alien vegetation and maintain cleared areas, improve land use practices to reduce sedimentation and water quality problems, improve monitoring and management of runoff and discharges from urban and agricultural areas, stock farm dams with indigenous fish rather than alien fish. **Recommend** that the Berg River and its tributaries be protected by a minimum 30m buffer from urban development, and intensive and extensive agriculture.

Spatial Planning Category (SPC) A.c: Rivers

Perennial rivers in the municipality are shown in Figure 2. Note that all rivers within the municipality are categorised within SPC A.c, even if they are not indicated on Figure 2.
Policy: SPC A.c

No earthmoving, construction, flood control measures or intensive agriculture within at least 30 meters8 of the riparian edge. Note that the riparian edge must be delineated by a specialist, based on a Department of Water Affairs and Forestry accepted method.

Appropriate land use

Appropriate land uses include those that allow the basic structure and ecological functioning of river ecosystems to be sustained and protected from degradation

Appropriate land uses include those that do not increase the potential for flooding and damage to property

All development in or of water resources require an authorization from DWAF in terms of the National Water Act, 1998 (Act 36 of 1998).

It is important for the Drakenstein Municipality to manage the impact and development pressure on its unique natural resource base. Specific measures must be taken to protect, enhance and rehabilitate (where required) key natural resource areas. Table 1 below provides a summary of key biodiversity priority areas and recommended actions (also refer to Drakenstein Municipality Strategic Environmental Assessment).

Table 1: Key biodiversity priority areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Recommended priority action</th>
</tr>
</thead>
<tbody>
<tr>
<td>South of Paarl</td>
<td></td>
</tr>
<tr>
<td>Berg River as an important corridor with small patches of endangered vegetation</td>
<td>Maintain natural vegetation buffer and prioritize clearing of alien vegetation</td>
</tr>
<tr>
<td>Large area of critically endangered vegetation in the vicinity of Pearl Valley</td>
<td>Maintain corridor connecting this habitat to the protected habitat of the Drakenstein Mountains</td>
</tr>
<tr>
<td>Patches of critically endangered and endangered habitat adjacent to protected areas of the Drakenstein Mountains</td>
<td>Maintain the interface between threatened habitats and protected areas as well as between different vegetation types. Avoid new agricultural development that will prevent linking of critically endangered habitats.</td>
</tr>
<tr>
<td>SAFCOL site (Hawequis State Forest) accommodates a rare diastella population</td>
<td>Determine appropriate time of year for harvesting in conjunction with SAFCOL</td>
</tr>
<tr>
<td>Endangered habitat adjacent to Simonsberg</td>
<td>Conservation opportunity forming a corridor extending into neighbouring Stellenbosch Municipality</td>
</tr>
<tr>
<td>West of Paarl Mountain</td>
<td>Prioritize clearing alien vegetation. Investigate potential to link</td>
</tr>
<tr>
<td>Fragments of vegetation on either</td>
<td></td>
</tr>
</tbody>
</table>

8 The “buffer” may need to be wider than 30 meters. This should further be determined on a case by case basis by a specialist ecologist in consultation with the Department of Water Affairs and Forestry (DWAF) and CapeNature to reflect site-specific factors. The approach for determining buffer width should consider the class of the ecosystem (per DWAF classification system), plus an assessment of the impacts to the ecosystem of the of the existing and proposed adjacent land use. It should incorporate an understanding of the current condition of the aquatic ecosystem and existing and proposed buffer, as well as the functioning of the system in the broader landscape.
<table>
<thead>
<tr>
<th>Area</th>
<th>Recommended priority action</th>
</tr>
</thead>
<tbody>
<tr>
<td>side of the Jan Briers Louw Provincial Nature Reserve</td>
<td>Jan Briers Louw Provincial Nature Reserve with City of Cape Town Biodiversity Network</td>
</tr>
<tr>
<td>Paardeberg slopes</td>
<td>Introduce measures to protect endangered Boland granite Fynbos. Set development parameters for Paardeberg.</td>
</tr>
<tr>
<td>Paarl Mountain</td>
<td>Paarl Mountain Management Plan recommendations. Investigate opportunities to expand protected area to include other patches of endangered vegetation</td>
</tr>
<tr>
<td><strong>Paarl, Mbekweni and Wellington</strong></td>
<td></td>
</tr>
<tr>
<td>Orleans Park (only known locality of a rare daisy)</td>
<td>Incorporate into Paarl green space network, but no lawns</td>
</tr>
<tr>
<td>Berg River and tributaries</td>
<td>Clear invasive alien vegetation and maintain cleared areas. Improve land use practices to reduce sedimentation and water quality problems. Improve management and monitoring of run-off and discharges from urban and agricultural areas. Stock farm dams with indigenous fish rather than aliens. Maintain a buffer area of at least 30m next to river</td>
</tr>
<tr>
<td>Patch of renosterveld adjacent to industrial area at Wellington</td>
<td>Clear alien vegetation</td>
</tr>
<tr>
<td><strong>Wellington to Hermon</strong></td>
<td></td>
</tr>
<tr>
<td>Areas surrounding Groenberg Provincial Nature Reserve</td>
<td>Support LandCare project and encourage stewardship projects to protect endangered and critically endangered habitats in private ownership. Protect corridors identified through SEA when considering new agricultural developments. Maintain corridor extending northward</td>
</tr>
<tr>
<td><strong>Hermon to Gouda</strong></td>
<td></td>
</tr>
<tr>
<td>Commonage area with endangered and critically endangered vegetation</td>
<td>Maintain link between commonage and protected areas. Develop alien vegetation management plan</td>
</tr>
<tr>
<td><strong>Gouda to Saron</strong></td>
<td></td>
</tr>
<tr>
<td>Commonage</td>
<td>Exploit potential to protect remaining renosterveld. Opportunities for tourism development (hiking trails)</td>
</tr>
<tr>
<td>Wetland</td>
<td>Fence off wetland to prevent impact from livestock</td>
</tr>
<tr>
<td>Koppie area</td>
<td>Develop guidelines for use as grazing area. Clear alien vegetation</td>
</tr>
<tr>
<td>Below canal</td>
<td>Develop guidelines for use as grazing area</td>
</tr>
<tr>
<td>Above canal</td>
<td>Clear alien vegetation</td>
</tr>
<tr>
<td>Berg River and tributaries</td>
<td>Clear invasive alien vegetation and maintain cleared areas. Improve land use practices to reduce sedimentation and water quality problems. Improve management and monitoring of run-off and discharges from urban and agricultural areas. Stock farm dams with indigenous fish rather than aliens. Maintain a buffer area of at least 30m next to river</td>
</tr>
</tbody>
</table>
Create sustainable and quality living environments

- promote a safe and healthy living environment with the necessary integration of multi-functional areas;
- ensure provision of services to communities in an environmentally sustainable manner;
- conserve the natural environment and enhance its resources to the benefit of all communities;
- respect and protect the cultural-historic heritage
Annexure 15: Drakenstein Municipality: Urban Edge

The Urban Edge Study, initiated by the Drakenstein Municipality in 2005, follows on the preparation of a Spatial Development Framework for the municipality. This study, in addition to an Urbanisation and Densification Study, an Open Space Policy study and a Cemetery Study is intended to complement and provide detail to the SDF, so that all these studies in combination provide a clear indication of Council policy with regard to urban development within the municipal area.

Definition of an Urban Edge

The urban edge boundary is a demarcated line and interrelated policy and guidelines (relating to the management of the urban edge line) that separates urban areas from rural areas. The intention of the urban edge is to establish limits beyond which urban development should not be permitted. Its primary purpose is to protect land outside the line for natural resource, agricultural, conservation, rural and open space use. It also serves to direct urban growth within the existing urbanised areas and towards the urban reserve areas i.e. the outer limit of urban areas.

Why do we need an Urban Edge?

It is recognised that pressure for development in the transition zone between the built up areas of settlements and the rural hinterland has escalated in the past few years in the Drakenstein Municipality. This often leads to negative socio-economic and environmental outcomes through inter alia:

- The loss of valuable agricultural land;
- Damage to natural systems and the natural resource base;
- Inefficient patterns of development adding to transport and other costs
- Inappropriate settlement location in disaster prone areas; and
- Loss of character of towns and undesirable visual impacts having direct implications for heritage resources and local tourism.

Effectively dealing with development along the edge of the current urban development, including the transition zone and proximate rural areas, is thus of great significance to ensure the sustainable development of settlements, particularly in the Drakenstein Municipality where the natural and rural environment is critical to economic and social development. The urban edge line and urban edge policy is an important tool in guiding, managing, controlling and encouraging appropriate urban development in the urban fringe.

Objectives and Function of the Urban Edge

The draft PGWC: Provincial Urban Edge Guidelines (2005) establishes two distinct functions for an urban edge. Each of these two functions has a number of related objectives that they should meet. The draft Drakenstein Spatial Development Framework (2005) establishes six objectives that an urban edge should accomplish. These six objectives can be grouped into the broad strategies as established by the PGWC: Provincial Urban Edge Guidelines (2005).

It is a Growth Management Tool: As a growth management tool, the urban edge is used to limit sprawl and the outward growth of urban areas, in favour of densification and infill development, to ensure more efficient use of resources and land within urban areas.
Growth management objectives include:

- Changing urban development trends to increase densities and ensure more efficient use of the available land;
- Reduction in infrastructure costs by engaging in urban redevelopment, infill and limiting the establishment of bulk infrastructure to service greenfield developments;
- A separation between urban and rural uses, thus increasing the value of urban land and maintaining the value of rural land;
- Providing a clear definition of the urban area and its community and increasing the integration of uses and social groups.

It is a Conservation Tool: As a conservation tool, the urban edge is used to exclude certain elements of the environment from the urban area, in order to protect or preserve it, or to discourage its development in the short and medium term, while long term implications are uncertain.

Conservation objectives include:

- The preservation of open space (green belts) and farm land surrounding the urban area;
- The conservation of natural or protected areas (such as nature reserves); and
- The protection of heritage resources (such as historic farmsteads).

The urban edge will provide the Drakenstein Municipality with management tools in order to ensure an orderly transition from urban to rural use.

It is important to note that this policy does not impact on any existing rights, nor does it grant any rights or absolve anyone from complying with the relevant legislation. In particular, the inclusion of undeveloped land within an urban area does not necessarily mean that development rights will be granted to such a property.

**Urban Centres in Drakenstein**

As a point of departure for this study, it was regarded as important to decide which settlements in Drakenstein qualify as urban centres and thus would be subject to the demarcation of an urban edge. It is argued that urban centres are settlements that contain the following elements:

- A residential component: The residential component of an urban centre would typically have a mix of incomes, a variety of densities, and a range of housing typologies. In certain smaller settlements, the range of housing options is often limited.
- One or more of the following economic activities: Commercial use, business use and retail use.
- Publicly provided social services and facilities: An urban centre can also contain privately provided social services and facilities in conjunction with publicly provided social services and facilities.
- Multi-modal transport system: The transport system in an urban centre includes public and private modes of transport. In addition, the bulk of the transport network is accessible to the general public.
- Open space accessible to the general public.
Thus the following urban centres have been identified in the Drakenstein Municipality for which urban edges are demarcated:

- Paarl-Mbekweni-Wellington
- Windmeul,
- Nuwedrift,
- Simondium,
- Bainskloof (Eerste Tol),
- Gouda,
- Saron, and
- Hermon.

**Informants to the Urban Edge**

The following informants were used in demarcating the urban edge for the urban centres in Drakenstein:

**Agricultural land and agri-processing:** Such land and uses were kept outside of urban areas as far as possible.

**Rural land, small farms & smallholdings:** Rural land and actively farmed smallholdings or small farms were kept outside of urban areas. Where urban uses (such as scrap yards) occurred on smallholdings they were included in urban areas.

**Open space (urban and regional) and natural areas:** Open spaces of regional significance and nature areas including areas of high biodiversity priority, protected areas (i.e., conservation areas and conservancies), such as the Paarl Mountain Reserve are located outside of the urban edge.

**Rivers and floodplains:** Where possible rivers and floodplains were placed outside of demarcated urban areas.

**Nature conservation and bio-regional planning:** The Spatial Planning Categories designated for Drakenstein informs the alignment of the urban edge. Generally, areas of conservation significance fall well outside the urban areas, and as a result are not a major informant into the urban edge.

**Topography and slopes:** The visual impact of development on crest lines and hill sides informs the delineation of the urban edge. Visible slopes and view sheds are placed outside the edge.

**Valuable landscapes:** Valuable landscapes consist of elements such as tree avenues of stature; farm buildings and architectural elements; places of historical; and vineyards which define the character and uniqueness of the area and contribute to the vistas and cultural landscapes of the Drakenstein Municipality. The delineation of the edge protects such landscapes where possible.

**Heritage resources:** These are defined in the National Heritage Resources Act, Act 25 of 1999 and include the following: places, buildings, structures and equipment of cultural significance; places to which oral traditions are attached or are associated with living heritage; historical settlements or townscapes; valuable landscapes and natural features of cultural significance; geological sites of scientific or cultural importance; archaeological and palaeontological sites;
graves and burial grounds; and sites related to the history of slavery. The urban edge should ensure that such resources are protected, preserved, and even enhanced.

Existing planning & growth management: The draft Drakenstein Spatial Development Framework (DSDF) identifies the desired direction and pattern of growth for the urban centres and rural areas of the Drakenstein Municipality. In particular, the structuring elements indicate where appropriate growth can be accommodated on the periphery of urban areas. In addition, the Urbanisation and Densification and Open Space Policy Study indicates how future growth should be accommodated in the Drakenstein area and, as such, are critical inputs to the urban edge demarcation, as they will determine how much urban reserve is required to accommodate growth for an agreed period. The study indicates that anticipated growth in Drakenstein over the next 10 to 15 years can be accommodated within the existing urban areas. These policies thus require a tightly demarcated edge, which will result in infill and densification. In addition, the draft Paarl Farms Land Use Management Study also provides an important input to the edge demarcation.

Zoning, approvals and housing projects: Erven with existing residential, commercial or other urban rights should be included inside the urban edge. However, there may be some cases where erven with existing residential and urban development rights has been placed outside of the urban edge due to their intrinsic conservation or aesthetic value. Every effort has been made to ensure that current approvals for urban development are included within the urban edge, where appropriate. In some cases, the edge may have to be modified in the short term to accommodate approvals and appeals currently lodged where a decision has not been taken. Similarly, every effort has been made to include current and planned municipal housing projects inside the urban edge.

Transportation Planning: Transport infrastructure is a major contributor to urban growth as it creates opportunities for urban expansion. Thus, planned road upgrades and linkages are important considerations in demarcating the urban edge. In the Paarl area, existing and planned road links between Paarl east and west aimed at improving integration influences the demarcation of the edge.

Service networks and infrastructure: The availability of services and the reach of networks impact on the affordability of development. Thus where peripheral land is needed for expansion the availability of services would influence the demarcation of the edge.

Types of Edges Indicated

- Paarl Farms Edge: An edge running along the boundary of the Paarl town farms that were subject to the Paarl Farms Land Use Management Study (2005). As this policy allows for limited residential development subject to detailed studies, it is recognised that the edge would have to be amended to include such development in the future.

- Permanent Edge: A ‘permanent edge’ that is a ‘non-negotiable’ aimed at protecting valuable natural environments farmland and areas of scenic or cultural value (identified no-go areas). This is similar to a hard edge, as defined in the PGWC: Provincial Urban Edge Guidelines, which states that hard edges are drawn where an absolute restraint on development is essential (PGWC: Provincial Urban Edge Guidelines 2005).

Notes regarding the Demarcation of the Edge
It is not possible to describe the urban edge in detail in the executive summary; therefore, the following will provide an indication of how the edge is demarcated:

Around the smaller settlements of Saron, Gouda, Hermon, Windmeul and Bainskloof Village, a tight edge has been drawn following the extent of existing settlement as no further expansion of these settlements is recommended for the following reasons:

- Protection of the heritage resources in Saron and Bainskloof Village, including the typology of the original village;
- Protection of valuable bio-diversity resources (vegetation) in close proximity to the settlements;
- Protection of valuable landscapes;
- Establishment of efficient patterns of development in Drakenstein that direct residential growth to higher order centres where there is greater access to jobs and other opportunities and services; and
- Protection of agricultural land.

Some infill development could potentially be accommodated in settlements such as Gouda and Hermon. The edge around Nuwedrift has been drawn to include the currently proposed housing development and extent of existing urban development only. In Simondium, the edge has been delineated around the existing node at the school and includes surrounding urban uses in this node. It is recognised that the edge may have to be amended in the short term to provide for housing opportunities at this node, however the identification of suitable land is a complex process and falls outside the scope of this project.

For the urban centre of Paarl/Wellington/Mbekweni a relatively tight edge has also been demarcated largely along the edge of existing development – this with a view to:

- Protect agricultural land;
- Protect valuable landscapes and heritage resources such as the Blouvlei area and the Dal Josafat farms; and
- Promote densification to establish an efficient pattern of urban development.

However the proposals of the SDF has also resulted in the provision for some growth, particularly on the northern border of Paarl West (east of Main Road) in the medium term to complement the proposed road link to Paarl east in this area as well as to the south of Klein Parys.

Areas south of the N1 in the vicinity of Boschenmeer and Pearl Valley have been excluded from the urban areas, as they do not have the characteristics of urban centres as defined in this study. This current edge is aimed at promoting infill development and densification in the traditional urban centres, particularly Paarl. It is never the less recognised that the area to the south of the N1 between the Berg River and R301 presents an opportunity for future expansion of the town once the density targets in the traditional settlement of Paarl have been reached.

**Land available for development within the urban edge**

The Densification and Urbanisation Strategy calculated that at a growth rate of 2.5 % per annum (based on Census information) provision has to be made for 16 498 additional dwelling units to accommodate the growth for the period between 2001 and 2016, as well as the existing
housing backlog (estimated at 13 000 units). It is important to note, that in addition to the 16
722 development opportunities within the urban structure identified through the Densification
and Urbanisation study, the edge has included approximately 797ha of land for greenfield
development in the Paarl-Mbekweni area. At a density of 10 du/ha (considered suitable for
development on the edges of urban areas) this could provide for an additional 7 970 units.
Therefore, the urban edge as indicated could potentially accommodate approximately 24 692
dwelling units (more than the required 16 498 required) in a variety of areas across in Paarl-
Mbekweni-Wellington in order to accommodate a range of development options for a variety of
income groups.

Guidelines and Policies

As a tight edge has been demarcated for the urban centres, the guidelines that are intended to
manage the interface between urban and rural areas indicate good management practice.
Where new or redevelopment is proposed these guidelines will be used when considering
applications. Guidelines have been prepared for the interface between various urban uses and
rural uses found along the urban edge, e.g. the interface between residential development and
nature areas where issues of setbacks, building height and massing, uses, landscaping and
fencing and servicing are addressed.

Specific guidelines for smallholdings have also been included. These are aimed at maintaining
the rural character of the many of the smallholding areas and provide guidelines with regard to
uses and subdivision.

Finally, the document also provides guidelines for considering the amendment of the urban
dge. The following aspects need consideration:

- Has any aspect of the informant to the edge changed or does it require revision?
- How will the proposed development contribute to the public good? For instance, consider the cost to Council with regard to the provision and long term maintenance of services, vs. the additional rates income.
- How does the application support, long term forward planning and policy of Council and the PGWC as set out in the spatial development framework or other approved policy?
- Will the approval of the application lead to further pressure for development in the area and so undermine the edge?
- How does the application respond to the urban edge guidelines?

Western Cape Provincial Urban Edge Guidelines

The Western Cape Provincial Urban Edge Guidelines provides guidelines for the determination
of urban edges throughout the province and puts forward the following informants, amongst
others, for the establishment of the edge:

- prominent landforms and character areas;
- valuable soils;
- hydrological factors (surface and ground water features);
- ecological resources;
- protected areas;
Overview of the study area

- high intensity/potential agricultural resources;
- service infrastructure (barrier effect);
- service infrastructure (capacity and reach);
- high order roads, access routes and transport infrastructure;
- cadastral boundaries;
- vacant and under-utilized land within urban areas;
- the availability of developable land in urban areas;
- growth requirements over a 10 – 20 year period;
- land use applications for new development;
- visual impact;
- cultural / heritage resource areas;
- ownership of land and existing land use rights;
- informal settlement areas;
- urban agricultural and small scale farming activities;
- bio-regional spatial planning categories (core and buffer); and
- density policy for residential development in rural towns.
Annexure 16: Drakenstein Integrated Development Plan (2007-2012) (relevant information)

Sustainable Objective 1: Sustainable and quality living environment with efficient infrastructure

KPA 1.1: Municipal Infrastructure & Related Municipal and Basic Services

As part of the Development Agenda the Strategic Objective 1 has the following Key Performance Indicators:

- Sanitation: All communities have access to decent sanitation by 2010
- Water: All communities have access to water by 2010
- Refuse Removal: All communities have access to decent refuse removal by 2010

The IDP stipulates the following Development Strategies and guidelines:

- Improve water and sanitation infrastructure for farm workers
- Upgrading and rehabilitation of waste water treatment facilities
- Solving of storm water problems.
- Upgrade/replace/rehabilitate sewerage system.
- Upgrade/replace/rehabilitate water distribution network.
- Upgrade/replace/rehabilitate storm water system.
- Upgrade/replace/rehabilitate waste water treatment works equipment.
- Reduce waste and ensure it is disposed of in an environmentally sustainable way.

KPA 1.2: Sustainable Living Environment

Development Strategies & Guidelines

Creating a Quality living environment

- To create sustainable living environment which are safe, healthy & well designed with interesting architecture and a strong CBD core and a vibrant population.
- Completed, relevant, community supported, user friendly SDF and subsequent/supportive Policies and/or Detail Frameworks
- Identify and develop land with required infrastructure in urban areas to facilitate housing delivery, Emergency Housing, Local Economic Development (LED) and social infrastructure.
- Greening and maintenance of urban landscape
- Nurture growth with variety of opportunities in housing, employment, recreation, culture and social amenities.
- Facilitate green communities and provide public spaces where people can come together.
- Encourage densification around the towns
KPA 1.3: Natural and Cultural Heritage

Strategic Objective Outcomes (Key Performance Indicators):

- Quality Natural Environment in terms of acceptable state of the environment
- Adequate protection and preservation of cultural/historic heritage

Development Strategies & Guidelines:

- Preservation of Natural Heritage
- Preparation of environmental management plans
- Undertake air quality monitoring systems and general compliance audits.
- Remove alien vegetation from rivers and storm water canals
- Provide educational programs
- Improve appeal of Paarl mountain reserve.

As part of the strategy alignment with national level the following strategic objectives are applicable:

- The eradication of housing backlog within the area of the CWDM area and in so doing provide security of tenure.
- Accelerate the provision of housing as a key strategy for poverty alleviation
- Utilise the provision as of housing as a major job creation strategy
- Utilise housing as an instrument for the development of sustainable human settlements in support of spatial restructuring
- Create a district wide natural environment network
- Conserve and protect the natural environment.
- Protect high value agricultural land
- Create a network of regional, compact settlements consisting of dispersed, defined and functionally discrete settlements connected by a supportive regional movement network.
- Create a services system that supports and re-enforces the settlement hierarchy by consolidating and clustering facilities.
- To provide access to existing and new facilities and opportunities
- Grow and diversify the economy into new seasons and opportunities.
- Ensure provision of basic infrastructure services for the Cape Winelands District Municipality as a whole and in so doing improve the quality of live for communities
  - To ensure that all homes, including those of farm works, have access to
    - Affordable and safe drinking water.
    - Affordable and adequate sanitation systems.
    - Safe waste management
- To ensure that all natural resources are well managed in a sustainable manner.
- To ensure a safe and efficient system of roads linking the settlements and economic zones and which complements the system of public transport.
Annexure 17: Drakenstein Spatial Development Framework

This Drakenstein Spatial Development Framework (SDF) aims to improve the current spatial structure and definition of urban functions within the Drakenstein Municipality and to improve access to opportunities – social, economic and otherwise – in both the urban and rural areas of the municipality.

The following strategies and interventions are proposed in support of this objective:

- The reinforcement of the current hierarchy of nodes (settlements).
- Development of rural service centres (RSC’s) in “rural districts”.
- Formalising emerging settlement areas.
- Providing new and upgrading existing basic infrastructure to address backlogs.
- Development of one uniform land use mechanism for the entire municipal area.
- Support for land reform projects and security of tenure for the landless.
- Promotion of a variety of housing typologies and densities to provide for all demand categories.
- Integration of historically segregated communities to build a common sense of belonging and redress the imbalances of the past.
- Providing access to the full range of urban opportunities and benefits available to all citizens.
- The alleviation of poverty and eradication of inequality based on gender.

The provincial SDF encourages urban development to be nodal and maintain an average density of 25 du/ha (Dwelling units per hectare). This kerbs urban sprawl and provides better access for the poor to better facilities and socio-economic activities. Nodal development localises the impact and thus can be better managed. Services can also be more efficiently delivered thereby promoting environmental health.

To address poverty through economic property and social wellbeing requires healthy ecosystem functioning to provide agricultural opportunities and basic services such as clean water. A healthy ecosystem relies on the conservation of natural resources which can be achieved through the preservation of core areas that are buffered from development, protection of water catchments, minimising the loss of biodiversity and minimising pollution of natural systems including rivers. All these factors amongst others maintain river integrity. Farms that are responsibly managed are suitable buffers to core conservation areas.

This Drakenstein Spatial Development Framework (SDF) aims to improve the current spatial structure and definition of urban functions within the Drakenstein Municipality and to improve access to opportunities – social, economic and otherwise – in both the urban and rural areas of the municipality.

The following strategies and interventions are proposed in support of this objective:

- promote and reinforce the current hierarchy of nodes (settlements);
- provide rural service centres (RSC’s) in “rural districts”;
- formalize emerging settlement areas;
- provide new and upgrade existing basic infrastructure;
- develop one uniform land use mechanism;
- provide support for land reform projects and security of tenure;
- promote a variety of housing types and densities;
- link historically segregated communities;
- provide access to the full range of urban opportunities and benefits to all; and
- contribute towards poverty alleviation and eradication of inequality based on gender.

**Open Space**

Open space provision in the municipality is closely linked to its natural resource base. The Berg river system in the Paarl/Mbekweni/Wellington region is used effectively as a green lung linking natural systems to open space provision, sports facilities and leisure areas. The system works particularly well in the southern Paarl areas and becomes less distinctive as the Berg River moves northwards. It is important for humankind to maintain positive contact with nature for social, cultural and other reasons and the municipality’s approach to its natural resources must be based on the following principles:

- open space should not be viewed as “add-on” or “left-over” space, but rather as an integral part of any urban environment;
- the place-making attributes of open spaces must be maximized to ensure a positive contribution to urban environments in especially low-income areas;
- the tendency to use existing open space for infill development should be avoided;
- access to natural systems and nature areas must be protected to ensure amenity and recreational opportunities are available to the largest possible section of the total community without compromising the integrity of the space; and
- open space management and investment in open space must be geared towards gaining maximum benefit for the community at large (the aim should be to allow open spaces to fulfil a range of functions including recreational, productive as well as leisure).

Higher density and mixed density development – land in the Drakenstein Municipality is a scarce commodity and valuable, productive agricultural land is coming under increased pressure.

**Socio-economic**

From a spatial perspective there are geographic areas of poverty that are largely concentrated in the rural areas and historically non-white urban neighbourhoods. In the urban areas poverty largely corresponds to the former non-white neighbourhoods, black townships and informal settlement areas.

**Land use**

Commercially cultivated agricultural land represents the majority land use occurring mainly in the central and western regions of the municipality with the eastern areas characterized by mountain ranges forming a spine along the municipality’s eastern edge. Urban development occurs intermittently along the central areas from north to south with the highest concentration in the central southern regions in close proximity to the N1 at Paarl and Wellington.
Urban Areas

Urban development occurs at Paarl, Wellington, Gouda, Saron and Hermon. The identification of land for residential development for the lower income groups is an important issue in Paarl and the municipality has recently commissioned Land Audit Studies for both its urban and rural areas aimed at identifying the development potential of all vacant land across the municipal area. Summaries of the results of these studies are listed in tables in Annexure 1.

Coupled to this and of equal importance is the determination of limits of development to contain urban sprawl and manage urban growth. The delineation of an urban edge to clearly define the extent and direction of urban development to ensure long-term sustainability must therefore be seen as an urgent priority.

The Rural Areas

The Drakenstein Municipality has an extensive rural component with vast expanses of agricultural land covering the majority of the municipal area from Simondium in the south to Saron in the north. The rural areas with its scenic beauty and world-renowned wine farms and wine route do not only provide for extensive and intensive agricultural activities but also a host of tourism related opportunities. Significant topographical and climatological variations occur within the rural areas and eight distinct farming areas (Figure 1) within the municipality have been identified by the Department of Agriculture:

- Agter Paarl
- Bergrivier/Paarl
- Drakenstein/Groenberg
- Franschhoek/Simonsberg
- Hermon/Gouda
- Twenty-four Riviere
Figure 1: Farming areas in the Drakenstein Municipality
Franschhoek/Simonsberg Farming Area

It is only the southern-most portions of the municipality between the N1 and the southern boundary that fall within the Franschhoek/Simonsberg Farming Area. The area is divided into two production areas, La Motte and Simonsberg, on the basis of topographical, soil and climatological differences. The variety of topographical conditions causes variations in the climate across the area and is especially evident in the rainfall patterns. Average rainfall varies from exceptionally good along the mountain ranges in the south to poor in the north-western portions. More than 60% of the average annual rainfall recorded occurs between May and August which means that even in the dry north-westerly regions the winter rainfall is intense. Summer temperatures follow a similar pattern ranging from mild on the slopes of the mountains in the Franschhoek Valley to high in the north-west. Heat waves are a common occurrence and maximum temperatures above 34 degrees are measured three to four times per month in some areas in the Franschhoek Valley. Winter temperatures, on the contrary, are generally mild throughout the farming area.

The area is known for its variety of agricultural products. Measured in terms of area of cultivated land, the most important produce are wine grapes, prunes, peaches for canning, pears and citrus fruit. In most cases wine grapes and fruit are cultivated in combination with large wine estates occurring in the Groot-Drakenstein and Simondium areas. Natural grazing is not considered to be of economic importance in this farming area.

Drakenstein/Groenberg Farming Area

This farming area covers the western slopes of the Klein-Drakenstein, Hawequa and Limiet Mountains up to the Limiet River in the north. It consists of two production areas, Klein-Drakenstein and Groenberg, totalling an area of approximately 14 300 hectares. Average annual rainfall drops significantly from very good on the mountain slopes in the east (Welvanpas, 800mm) and south-east to poor in the western portions (Landau, 500mm) of the farming area. Summer temperatures significantly high (above 34 degrees five to six times per month) to the extent that the climate is sometimes not suitable for the production of premium wine grape cultivars. South-easterly (summer) and north-westerly (winter) winds occurring generally across the area is a significant characteristic of climatic conditions in the area with the former being more devastating to crops. Some farms are more exposed to these wind conditions and in some cases crop damage of 50% or more is caused in this manner every five to six years.

The production of wine grapes (main cultivars Chenin Blanc, Cinsaut, Colombar and Riesling) is the most important agricultural activity in the area with guavas, table grapes, prunes and citrus fruit being the most important supplementary products. Natural grazing is not considered to be of economic importance in this farming area.

Bergrivier/Paarl Farming Area

This farming area covers the agricultural land on both sides of the Berg River from the N1 National Road in the south up to the farm Majuba in the north and covers an area of approximately 17 800 hectares.

Average annual rainfall is considered to be average to low with the exception of the mountainous areas. More than 65% of the annual rainfall occurs between May and August. High summer temperatures (above 34 degrees on average seven to eight days per month) create unfavourable conditions for the production of premium wine cultivars whilst mild winter temperatures exclude the production of some deciduous fruit requiring certain low level
temperatures. The Berg River is the main source of irrigation water for farms along its banks and provides sufficient amounts of water throughout the summer for intensive irrigation. The availability and quality of irrigation water in this farming area is considered to be favourable.

The most important agricultural products in the area are table and wine grapes. Small amounts of prunes, desert and canning peaches and pears are also produced. Strawberries and melon for export are produced in limited amounts during the early stages of vineyard establishment. Natural grazing is not considered of economic importance in this farming area.

**Agter-Paar/Paardebberg Farming Area**

The Agter-Paar/Paardebberg Farming Area stretches from Simondium in the south, between the Paarl Mountain in the east and the Paarl Magisterial District boundary in the west up to the Berg River in the north-east. The farming area covers a total of 15 812 hectares of land.

A characteristic of the region is its relatively moderate climate promoted by a regular afternoon sea breeze. Average annual rainfall varies from moderate to poor with low summer rainfalls and more than 60% occurring between May and August. Periodic droughts occur during the winter growing season for grain and have a limiting effect on harvests. Summer temperatures are sometimes high and increase from south to north. Heat waves occur during summer and the mild winter temperatures exclude the production of some deciduous fruits. Although the area sometimes experiences windy conditions, damage to crops as a result thereof is limited.

Wheat production together with dry land grazing and its associated livestock farming are the most important agricultural activities in the area. The production of wine grapes is an important supplementary activity on most farms whilst some deciduous fruit, nuts and even citrus fruit is produced where adequate amounts of water is available. Natural grazing is not of economic importance for this farming area.

**Hermon/Gouda Farming Area**

The Hermon/Gouda farming area stretches from the Limiet River in the south to just north of Saron in the north with the Berg River forming its western boundary and the Elandskloof, Voëlklei, Obikwa and Saron Mountain ranges the eastern boundary. The area covers a total of 42 741 hectares of land.

Average annual rainfall in the area decreases rapidly from moderate along the slopes of the mountains forming the eastern boundary to poor in the west. Rainfall is concentrated in the winter months, creating perfect conditions for the production of winter grain. Periodic droughts during the rain season, however, present an important risk factor. Summer temperatures are generally very high and together with strong south-easterly winds have a severely limiting effect on the production of summer crops.

The relatively small pockets of natural grazing in the area are not utilized to a significant extent and are therefore not considered to be of economic importance for the farming area. The most important produce is wheat with wine grapes produced under irrigation along the Berg River and irrigated grazing for sheep farming where water is available. Major agricultural problem areas include the small farming units impacting negatively on economic viability and the limiting effect of the strong south-easter.

**Twenty-four Riviere Farming Area**

This farming area is located on both sides of the Twenty-four Riviere River and stretches from the Saron Mountains in the east up to the confluence of the Berg and Twenty-four Riviere Rivers.
The climate is very similar to that of the Hermon/Gouda Farming Area and the availability of irrigation water in this farming area is the most important reason why there is a difference in farming patterns between the two areas. Average annual rainfall is moderate to poor and the production of summer crops is only possible because irrigation water is available. The dry summers are very favourable for table grape cultivars whilst the moderate frost-free winters and high spring temperatures are important conditions for vegetable and fruit production. Summer temperatures are very high with strong southerly winds necessitating protective measures for summer crops.

The most important products of the farming area are wine and table grapes and vegetables. The early export market is an important target of grape farmers and the cultivars Alphonse Lavallee en Sultana are sought-after products on the international market. The area is also known for its large-scale production of tomatoes, green beans and squash and other vegetables. Natural grazing is of no economic importance for this farming area.

**Conservation**

**Natural resources within the Drakenstein Municipality**

**Background**

Drakenstein Municipality is located within an area of both international and national biodiversity significance. Internationally, South Africa is recognized to be the third most biologically diverse country in the world, after Indonesia and Brazil. Within South Africa, the Cape Floristic Kingdom (which stretches from Nieuwoudtville in the west to Port Elizabeth in the east) is one of the richest areas of the world in terms of plant diversity and endemism (approximately 70% of the plants are endemic, meaning that they are found nowhere else on Earth). The Cape Floristic Kingdom was declared a World Heritage Site in June 2004. The Cape Floristic Kingdom World Heritage Site is made up of eight separate protected areas, which together are considered important representative examples of the Cape Floristic Kingdom. This includes the Boland Mountain Complex within Drakenstein Municipality.

Drakenstein Municipality is therefore the custodian of some of the last remaining lowland renosterveld and fynbos habitats (Figure 2: Natural remnants layer for Cape Lowlands Renosterveld Project). While the mountainous areas are relatively well protected, the river valleys and fertile lowlands are highly threatened by uncontrolled urban and agricultural development. In this fragmented modern landscape, with only limited amounts of natural habitat left, it is crucial that human activities are considered and managed to prevent the further collapse of the unique and irreplaceable biodiversity, and related ecosystem services, within the Drakenstein Municipality (Figure 3: Nature Reserves).

South Africa’s first national assessment of spatial priorities for conservation action, the National Spatial Biodiversity Assessment, was completed in October 2004, led by the South African National Biodiversity Institute. The National Spatial Biodiversity Assessment supports the National Biodiversity Strategy and Action Plan, led by the Department of Environment Affairs and Tourism.

The National Spatial Biodiversity Assessment describes how intact and well functioning terrestrial, freshwater, estuarine and marine ecosystems currently are in South Africa, based on four categories:

- **Least threatened** (still largely intact);
Overview of the study area

- **Vulnerable** (reasonably intact, but nearing the threshold beyond which they will start to lose ecosystem functioning);

- **Endangered** (have lost significant amounts of their natural habitat, impairing their functioning); and

- **Critically endangered** (have so little natural habitat left that not only has their functioning been severely impaired, but species associated with the ecosystem are being lost).

Critically endangered, endangered and vulnerable ecosystems may be listed by the Minister or MEC as “threatened ecosystems” in terms of the Biodiversity Act (Chapter 4). In terms of the Act, these ecosystems are subject to special precautions.
Figure 2: Natural remnants layer for Cape Lowlands renosterveld project
Figure 3: Nature reserves
The National Spatial Biodiversity Assessment found that five percent of South African ecosystems are critically endangered, and that the majority of these (approximately sixty percent) are located in the Western Cape. Drakenstein Municipality is one of five Western Cape municipalities containing the highest number of critically endangered ecosystems (Figure 4: Bio-diversity priorities for the Drakenstein Municipality).

**Overview of terrestrial environment**

The Cape Floristic Kingdom in general has a high faunal diversity (more than 560 vertebrate species) in both its terrestrial and aquatic environments, and high levels of unique invertebrates. Over fifty-five percent of the forty-four frog taxa recorded in the Cape Floristic Kingdom are endemic. Two species of tortoises occur almost exclusively within this region. The Cape Floristic Kingdom is also a priority endemic bird area (Birdlife Africa).

Vegetation types (Figure 5) provide a good indication of important areas for biodiversity, because most mammals, birds, insects and other organisms are associated with particular vegetation types.

Fynbos is the dominant vegetation group of the Cape Floristic Kingdom, largely confined to nutrient-poor soils. Unlike mountain (sandstone) fynbos, which is well-conserved in provincial nature reserves and generally not threatened, lowland fynbos is severely threatened in the municipality.

Renosterveld is the other main vegetation group within the Cape Floristic Kingdom. Renosterveld occurs on fertile clay soils where shrubs of the daisy family (including renosterbos) are usually dominant, along with an exceptional diversity of flowering bulb species. It is also one of the most threatened habitats in the Cape Floristic Kingdom and within Drakenstein Municipality. Less than three percent of the original renosterveld remains, with less than one percent currently formally protected. The largest remaining fragment of renosterveld within the municipality is in the Elandsberg Contract Nature Reserve.

Six vegetation types have been mapped as critically endangered within the municipality (SANBI 2004; Mucina et al. 2004). They are:

- Cape Flats Sand Fynbos;
- Elgin Shale Fynbos;
- Swartland Alluvium Fynbos;
- Swartland Granite Renosterveld;
- Swartland Shale Renosterveld; and
- Swartland Silcrete Renosterveld.

A further three vegetation types have been mapped as endangered. They are Atlantis Sand Fynbos, Boland Granite Fynbos and Cape Winelands Shale Fynbos (SANBI 2004; Mucina et al 2004).

Loss and fragmentation of natural habitat severely threatens the integrity of the remaining natural habitat in the municipality. Ecological processes typically only function well where natural vegetation remains, and in particular where the remaining vegetation is well-connected with other nearby patches of natural vegetation. Where basic
Figure 4: Biodiversity priorities for the Drakenstein Municipality
processes are intact, ecosystems are likely to recover more easily from disturbances or inappropriate actions if the actions themselves are not permanent.
Description of aquatic environment

South Africa is a water-scarce country with multiple competing demands on our limited water resources. It is projected that South Africa will experience water stress or water scarcity by 2025 under all United Nations population growth projections. The average amount of water available per person per year has been projected to decrease by more than 50% by 2025 as a result of population growth (River Health Programme 2003).

The condition of our rivers, wetlands and groundwater is also heavily influenced by the way the land is managed throughout entire catchments, for example by agricultural and forestry practices, and infestation by invasive alien plants.

Any infrastructure, including buildings and hardened surfaces such as roads and parking lots, built within a river floodplain dramatically increase the likelihood of flooding and damage to property. The City of Cape Town Stormwater Management Guidelines (2002) state that the management of land use, development or activities adjacent to rivers and wetlands is important for the following reasons:

- It is generally more cost effective in the longer term, to develop in locations that are intrinsically safe from flooding rather than engaging in flood mitigation works to protect such development, which often has to be carried out retrospectively;
- Modifications to natural systems require a long-term commitment to the maintenance thereof, particularly as natural processes seek to establish the former status quo; and
- Floodplains, wetlands and vleis fulfill important ecological and social functions.
- Some wetlands may be seasonal, that is they appear to be wet only at certain times of the year. Seasonal wetland habitats and intermittent drainage lines are particularly vulnerable because they are often not identified as important habitats, especially during the dry season.

Protected Areas

The system of protected areas in the municipality currently includes:

- Statutory Protected Areas, include all or portions of
  - Hawequas Provincial Nature Reserve
  - Groenberg Provincial Nature Reserve
  - Waterval Provincial Nature Reserve
  - Groot Winterhoek Provincial Nature Reserve
  - Jan Briers Louw Provincial Nature Reserve
  - Simonsberg Provincial Nature Reserve
  - Elandsberg Contract Nature Reserve
- Provincial Nature Reserves are managed and owned by CapeNature.
- Contract Nature Reserves are legally binding contracts between Cape Nature and a landowner for the protection of these habitats in the long term. They are valid in perpetuity or a minimum of 50 years (negotiated on a case by case basis). Private ownership of the property is in no way compromised or transferred by this agreement
and the Contract Nature Reserve enjoys the same status as a provincial Nature Reserve under the Protected Areas Act (57 of 2003).

Contract Nature Reserves have secure, legal status on three levels:

- According to the new Protected Areas Act, No. 57 of 2003 any land (private, communal or municipal) can be contracted into a National Park or Provincial Nature Reserve, which implies that an entire cadastral property or merely a portion of one can be recognized as a national protected area. Contract Nature Reserves must be declared a provincial nature reserve by the provincial MEC. For this to be effected, the landowner and MEC must sign a letter of consent to declare it a nature reserve, which must also include the restrictions for the site;

- A legal contract (also referred to as a Management Agreement for the site) is entered into between the landowner and the agency;

- A Notarial Deed is drawn up for the site detailing the restrictions which are placed on the title deed. This Notarial Deed is lodged at the deeds office and must be signed by the Notary Public. When the property is sold, the new owner is obliged to continue adhering to the restrictions in the notarial deed.

Note: The old CapeNature designation of Private Nature Reserve has fallen away and is being replaced by the Contract Nature Reserve designation.

Other Protected Areas include:

- Local Authority Nature Reserves
- Mountain Catchment Areas

These include Paarl Mountain Local Nature Reserve and the Hawequas Mountain Catchment Areas.

**Strategy formulation**

The preparation of the Drakenstein Municipality: Spatial Development Framework is based on broad objectives and strategies for future development of the municipal area:

- appropriate spatial development;
- the provision of adequate, well-located housing for the poor;
- environmental conservation;
- ease of movement;
- agricultural development;
- efficient and appropriate land use management practices;
- adequate provision of community facilities;
- the provision of basic infrastructure on an equitable basis;
- urban conservation and urban renewal; and
- safety and security.

It is through these objectives/strategies that this Spatial Development Framework for the Drakenstein Municipality intends to provide a policy framework for the spatial implementation...
Overview of the study area

- provide housing opportunities to homeless families;
- facilitate local economic development that provides access to maximum job opportunities in a pro-poor programme;
- improve the quality of life through human development, increased and equitable access to social facilities and a quality living environment and associated infrastructure and basic services; and
- improve community safety and safety of the living environment that is conducive to social upliftment and economic growth.9
- embrace the principles of sustainable development, as defined by the National Environmental Management Act (NEMA) - “the integration of social, economic, and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations”;
- developed mechanisms that will ensure the efficient, economic and effective management of resources in an integrated manner and to the benefit of the entire community;
- commitment to the goals and targets of Agenda 21.

Settlement development
- Focus on quality rather than quantity;
- apply the principles of bio-regional planning;
- support for the DFA principles for land development (see above); and
- the creation of sustainable and viable settlements through reinforcing existing internal and external links, rather than developing new nodes/links thereby prohibiting indiscriminate development through containment, integration and setting strong development limits.

Natural Environment
- Protect the Municipality’s special natural features by:
  - avoiding the loss of natural habitat in threatened ecosystems and priority ecological corridors;
  - protecting high potential agricultural resources;
  - protecting water resources and the functioning of freshwater ecosystems;
  - encouraging community-based natural resource management, both through community initiatives as well as conditional requirements of private developments.
- promoting the appropriate agricultural use of productive and potentially productive agricultural land through appropriate incentives and land reform initiatives promoting small-scale agricultural activities.

Socio-Economic
communities must be actively involved in all aspects of planning and decision-making that affects their lives;

- pay special attention to the needs of the rural poor;
- put people first (Batho Pele);
- reinforce and build upon the economic advantages of the municipality;
- foster compliance with the National Spatial Development Perspective (NSDP) investment guidelines that motivates that:
- corridors of existing and potential development opportunity should be targeted for future settlement and economic development; and
- densification of existing settlements should take priority over extension or development of new settlements.

**Spatial development in the Drakenstein Municipality**

The Western Cape PSDF proposes that, "as a general principle", fixed infrastructure investment be directed to those areas that show high economic growth potential in the first instance and high human need in the second. In the Drakenstein Municipal area the towns of Paarl and Wellington have been identified as Priority 1 (high economic development potential and high socio-economic need) and Priority 2 (high economic development potential and low socio-economic need) areas respectively.

The study proposes five main strategies to achieve densification in the municipal area that can be summarised as follows:

- "no-go" strategy – heritage areas, within river corridors, vacant land that has an existing or potential important function as public open space;
- Demolition and redevelopment – in well-located areas where existing development is of a low intensity;
- Infill – in existing suburbs where there is unused or under-utilised pieces of well-located vacant land;
- Subdivision, second dwelling, sectional titles – in areas with large plots permitting subdivision into two or more smaller plots or permitting a second dwelling on an undivided plot or creating two or more apartments from a large residential building for sectional title;
- Greenfields development – subdivision of farms where infill, resubdivision and densification is not possible;
- Brownfields development – rehabilitation and development of land previously used for urban services or transportation

Urban-related development will only be considered under the following conditions:

- No development is to be permitted in the horizontal corridor extending 30m on either side of the Berg River
- Urban-related development should be strictly limited to developments that enhance the rural character of the area and do not distract from the scenic quality of the surrounds (clear design guidelines must be developed);
Gouda

- The implementation of an urban edge for the Gouda urban area as determined through the Drakenstein Municipality Urban Edge Study (MCA Planners 2006) is supported;
- Urban development to be limited to infill actions within the existing urban structure of the town;
- Promote agricultural smallholdings on commonage;

Rural development

“Land and agricultural policy reform in South Africa holds the promise of increasing equity and generating jobs. The Government’s target is to redistribute at least 30% of the land in 15 years and complete the restitution process by the end of 2008. In 1993, a joint South African and World Bank team estimated that reaching the land redistribution target would cost between R22 and R26 billion in total, or about R1.5-1.7 billion per year, and create the equivalent of 600,000 net full-time farm jobs at about R35,000 per job. The main efficiency impact of a well-executed land reform program would come from a more intensive use of agricultural land and the multiplier effect created by a more dynamic rural economy based on a substantial increase in the number of small family farms”.

Open Space

Open space provision in the municipality is closely linked to its natural resource base. The Berg river system in the Paarl/Mbekweni/Wellington region is used effectively as a green lung linking natural systems to open space provision, sports facilities and leisure areas. The system works particularly well in the southern Paarl areas and becomes less distinctive as the Berg River moves northwards. Open space provision in the historically disadvantaged areas is characterized by a fragmented pattern, a general state of neglect and a sense of left-over, “unusable” space. The “green theme” of the municipality’s rich natural resource base – its rivers, landscape features, cultivated areas – is somehow lost in the dormitory suburbs of Mbekweni, Newtown, New Orleans, Chicago and others where undeveloped and neglected open space has become dumping grounds and eyesores.

The major rivers are key components of the municipality’s open space structure and should be treated as such. The growing need for urban-related development, and more so low-income residential development, places great strain on the natural system and the 1:50 year floodplain areas are under constant threat. The formulation of management plans for the 1:50 year floodplains must be given serious consideration. In addition, the implications of development proposals in relation to the sustainability of natural systems, especially rivers and water bodies must be carefully assessed. Management plans for rivers in the municipal areas must be developed to:

- protect the ecological functions of these rivers;
- encourage and ensure public access; and
- support water-dependent development.

The rivers, where they pass through urban areas, must be re-established as urban structuring elements. The recreational and amenity value that they offer must be harnessed and clear linkages established with existing open space, where possible, to develop a clear “web” of green structuring elements. Such a green system will facilitate an improvement in the overall urban environmental quality, whilst creating new opportunities for leisure activities such as
cycling and walking. Recent trends in golf estate and other low density type developments, especially in the areas south of the N1, are threatening to reduce the level of access of poorer communities to natural systems such as rivers and mountain areas. These developments, by their very nature are exclusive and care must be taken in the evaluation of development proposals of this nature to ensure that access to nature areas is maintained and enhanced.

One of the obvious problems regarding open space in the low-income areas is the lack of appropriate management or supervision of these spaces. This has resulted in a neglected state of open space in these areas and their eventually becoming the domain of criminals and undesirable elements. New developments must take cognizance of this and ensure an appropriate interface between open space and development, perhaps in the form of new, higher density housing. At the same time, appropriate recreational facilities, of which there is a dire shortage in most of the historically disadvantaged areas, should be developed within these spaces to allow for a more efficient use of space.

It is important for humankind to maintain positive contact with nature for social, cultural and other reasons and the municipality’s approach to its natural resources must be based on the following principles:

- open space should not be viewed as “add-on” or “left-over” space, but rather as an integral part of any urban environment;
- the place-making attributes of open spaces must be maximized to ensure a positive contribution to urban environments in especially low-income areas;
- the tendency to use existing open space for infill development should be avoided;
- access to natural systems and nature areas must be protected to ensure amenity and recreational opportunities are available to the largest possible section of the total community without compromising the integrity of the space; and
- open space management and investment in open space must be geared towards gaining maximum benefit for the community at large (the aim should be to allow open spaces to fulfil a range of functions including recreational, productive as well as leisure).

The Drakenstein Municipality has recently completed an Open Space Study (Densification and Urbanisation Strategy and Open Space Utilization Policy: Phase 1, CNdV 2005). This study concludes, amongst others that:

“Rivers and wetlands are important resources with regards to their ecological functioning of this important source of life [and] … also offer considerable amenity with respect to property values and the quality of life that can be enjoyed near water. Unfortunately, urban development in South Africa has tended to treat rivers as drains and sewers to which urban development often turns it back. Paarl is no exception to this and both the main stem of the Berg River and many of its tributaries are generally litter-filled wastelands, often backing onto industrial areas, and are sometimes locations of antisocial behaviour”;

“… quite considerable areas of the town along the river corridor cannot be developed. However, outside of the river corridors relatively intense development should be encouraged so as to maximize the amenity and recreational potential of the river corridors and in this way also contribute to waste management and river cleanliness”;

“… there is an internal network of open spaces that must be retained and developed as public parks, market gardens, sportsfields, and other open spaces necessary for both social
recreation and the ecological function of the town. [The diagram below] … identifies the basis of a preliminary network of open spaces. In some instances the open spaces are over-scaled, but, rather than developing them completely, the opportunity exists for creating an open space that can be more intensively used, but with increased security because of new urban development that can overlook the space”.

Small-scale agricultural development
The Drakenstein Municipality has vast areas of productive agricultural land and it is here that the rural poor find themselves living. In areas such as these, smallholder agriculture is unlikely to be a driver of rural growth, but has the potential to perform vital food security and social functions. In addition to this smallholder agriculture has the advantage for low technology, labour-intensive production of traditional produce. Some of the major challenges for small and micro agricultural practices are the establishment of sustainable and efficient rural food markets and the continued degradation of the natural resource base as a result of the growing population. Public investment and strategies need to be geared towards intensification of semi-subsistence agriculture in order to enhance the ability of poor households to meet their food needs through own production. This could be in the form of a greater emphasis on soil and water conservation and support services such as common property resource management and livestock support services. In the longer term fragmented smallholder agricultural units may be consolidated to increase productivity.

Developing the capacity of smallholder farmers
FARM-Africa, an NGO working in the agricultural sector in the Northern Cape, has been working with impoverished rural communities in South Africa as well as the rest of sub-Saharan Africa to develop the capacity of smallholder farmers and herders to access and use local resources and influence policy by, inter alia:

"increasing their access to markets, which generates more income. Farmers learn how to source market information, improve production and establish links with transporters and financial institutions”10.

Municipal commonage in and around the rural towns are available for an intensive smallholder farmer establishment and support programme, but a number of options and alternatives must be considered to accommodate the diverse needs and unique situations of the various communities in the Drakenstein Municipality. Such options and alternatives could include:

- Communal tenure arrangements;
- Access to state land for landless people;
- Private land acquisition through innovative purchase or rental schemes;
- Ongoing farmer settlement and support to beneficiaries of land redistribution programmes; and
- Urban and peri-urban farming projects and schemes11.

Environmental conservation
The principles of bioregional planning has been applied to determine broad-brushed spatial planning areas for the entire municipality based on the six Spatial Planning Categories (SPC’s)
as contained in the Manual for the application of bioregional planning in the Western Cape Province (Chapter 7).

Land use management policies aimed at containing development and the protection of valuable natural resources including agricultural land are contained in Section 7.4. However, a number of broad overarching policies seeking to establish an overall conservation approach for the Drakenstein Municipality must be established and should contain, amongst others:

- Minimal intervention in areas of natural, historic and cultural significance;
- Respect for the contribution of all periods in the history of the municipal area and no one period to be seen as dominating over the other;
- Respect for all cultures and the celebration of diversity as a means of unifying rather than separating;
- Concern for the visual quality of the landscape and the impact of inappropriate development and development parameters thereon;
- Recognition for the important role of agriculture in the social and economic development of the community and the protection of agriculture related resources;
- Recognition of the impact of agricultural activities on the natural environment and the containment thereof;
- Protection of the quality and ambience of towns through appropriate development strategies; and
- Protection of the right of individuals to access nature areas, whilst at the same time limiting the negative impact thereof.

In light of the increasing development pressure within the Drakenstein Municipal area it is important that specific guidelines be set to ensure that both the natural and built environment is protected against indiscriminate development through:

- the containment of urban sprawl by delineating urban edges for the various towns;
- the establishment of appropriate urban design guidelines for historic precincts within the urban areas;
- the identification and management of conservation-worthy natural areas; and
- appropriate land use management guidelines to protect valuable agricultural land and resources.

Urban development should, where possible, be contained within the existing boundaries of the major towns and development policy should be geared towards compaction rather than indiscriminate sprawl. It is recommended that detailed urban edge studies be completed for all of the major urban centres to determine a fixed edge beyond which no development of an urban nature should be allowed.

**Land use management**

The current land use management system of the Drakenstein Municipality has not kept pace with the recent developments in local governance or the changing focus in spatial planning from the prescriptive to a more developmental role. An Integrated Zoning Scheme has recently been compiled for the municipal area and is still in draft form. The completion of this Integrated
Zoning Scheme must be informed by the principles contained in this SDF and reflect the new development planning paradigm.

The land use management system must be aligned to the Municipal Spatial Development Framework and a uniform system must be developed for the entire municipal area. The development of such a system should be guided by a clear set of principles that will address the historically distorted patterns of land development as well as the spread of the benefits of land utilization in an equitable manner across the municipality.

Macroplan has recently developed a series of guidelines to assist decision-makers in their consideration of land use applications in the absence of a comprehensive land use management system. These guidelines have been used in the preparation of the Witzenberg and Breede Valley Municipal Spatial Development Frameworks and due to the need for alignment of the systems used in the entire Boland District Municipality and the contextual similarities, these guidelines (with minor adjustments) are considered appropriate for application in the Drakenstein Municipality.

Resort developments within rural nodes (settlements) should be considered carefully so as not to detract from the historical or unique rural character that may exist.

Resort developments should preferably not be permitted in Core Areas and if such development is permitted, it must:

- be of limited scale only
- be subject to control measures that have been extremely carefully considered; and
- not consist of any freehold units (that is, no holiday (or any other permanent) housing.

In addition, the following guidelines must be taken into consideration in the evaluation of applications for resort developments:

- no development may occur in otherwise undeveloped catchment areas for surface water resources;
- no development may occur within the 1 : 50 year floodline, or in the absence of a flood line demarcation, within 150 m of any water course identifiable as a seasonal stream or river or any dam in such water course, other than a tourist facility or limited accommodation units over a distance of no more than 50 m along the water course. A buffer zone of 30m must be maintained on both sides of rivers within which no development is allowed;
- development within 150 m of any water course must be subject to environmental impact studies as required by the Municipality and/or the relevant environmental legislation and in accordance with an environmental management plan to ensure that the water quality of the water in the water course does not diminish and that the water course itself is not degraded or significantly changed through the planting of vegetation, the diversion or disturbance of flows or the extraction of water for use in the development;
- the number of accommodation units allowed in any definable area such as a unique kloof or along the side of a dam will be limited to suit the specific conditions in the area with a clear distinction being made between land for low intensity farming areas where grazing is the predominant land use and where the land is intensively cultivated or forested;
development proposals in mountain areas will be subject to an environmental plan as required by the Drakenstein Municipality and/or the relevant environmental legislation that addresses amongst others, the visual impact of the proposed development as well as the impact on the natural environment; and

development will be promoted in areas where communities, as opposed to individuals, can benefit directly from involvement in the tourist industry as guides, managers, owners and developers of the tourist facilities.

The establishment of agricultural holdings in the urban fringe

The Drakenstein Municipality, with its highly productive vineyards, needs to respond to the variety of farming land needs on the fringes of the various urban centres within its area of jurisdiction. This response should take due cognizance of environmental management considerations in the urban fringe, sustainable use of resources and the integration of farming needs with other land use requirements in the fringe areas. The Provincial Administration: Western Cape (PAWC)\textsuperscript{12} has produced a Policy for the Establishment of Agricultural Holdings in the Urban Fringe based on the following policy principles:

- Choice – various options should be available for the establishment of agricultural holdings;
- Justness and transparency – processes must be open and fair;
- Affordability – target beneficiaries should be able to afford;
- Feasibility – especially with regard to service delivery;
- Integration – spatially linked to other uses;
- Sustainability – must contribute to the agricultural sector and provide a livelihood to new farmers;
- Environmental conservation – options must contribute to conserving both the natural and built environment;
- Cost effectiveness – scarce resources must be applied effectively.

Not all agricultural holdings established in the fringe areas are alike. Since local needs and circumstances determine what options would be most appropriate for a specific area various alternative farming models can be differentiated, according to the following criteria:

- Type of venture – commercial, project-based or community agriculture;
- Type of framing – soil based, non-soil based or a combination;
- Settlement – extent of permanent settlement to be restricted;
- Tenure – ownership, leasehold or agreement on conditional usage rights; and
- Locality – agricultural holdings may be established on existing or new municipal commonages, on state, provincial or municipal land or privately owned existing or subdivided farms.

To guide the Municipality in the effective management of its urban fringe areas, co-ordinated land development planning in the form of a Sectoral Plan as envisaged in the Western Cape Province of the Western Cape: Policy for the Establishment of Agricultural Holdings in the Urban Fringe, September 2000

\textsuperscript{12} Province of the Western Cape: Policy for the Establishment of Agricultural Holdings in the Urban Fringe, September 2000
Planning and Development Act, 1999 (Act 7 of 1999) is required. This Sectoral Plan should, amongst others, address the following issues:

- demarcation of the urban fringe;
- a survey of agricultural resources;
- a survey of environmental features (built and natural) in the fringe;
- a survey of agricultural activities;
- urban growth spatial requirements and its impact on the fringe; and
- non-urban land use requirements.

**Broad management guidelines for the establishment of agricultural holdings**

This Sectoral Plan, once completed should provide guidance to the municipality’s land use management insofar as it determines where agricultural holdings can be established in the urban fringe. Broad guidelines, as contained in the Western Cape policy should be applied to all land areas within the municipal area and include:

**Locational criteria**

Allow the establishment of agricultural holdings and practices only on land that supports the sustainable use of agricultural resources within the urban fringe. Non-farming uses should not be allowed on such land.

**Zoning**

Appropriate zoning should be applied to differentiate between areas with potential for agricultural activities and those without such potential.

**Subdivision**

The subdivision of land for agricultural purposes should be closely monitored and managed. The emphasis for commercial agricultural purposes must be on the ability of the land portion to sustain an economic farming unit. For project-based initiatives the land parcel must be large enough to sustain the objectives of the project. As the minimum size of subdivisions will vary according to the crop types and farming conditions, consultation with the Department of Agriculture is essential in the consideration of applications.

**Smallholdings**

In the establishment of smallholdings a clear distinction must be made between:

- Smallholdings of a residential nature;
- those of a bona fide agricultural nature; and
- those within nature reserve areas.

It is the experience of many Western Cape towns that smallholdings are primarily used for extensive residential purposes. The establishment of residential smallholdings on land suited for agricultural purposes in the urban fringe should not be supported. These should be limited to marginal land at suitable locations as may be determined by the Sectoral Plan for the Urban Fringe to be compiled as set out above and in consultation with the Department of Agriculture.

Although each application should be considered in its own context and judged on its own merits, the following minimum sizes for smallholdings in the urban fringe are considered advisable by the Department of Agriculture:
Agricultural smallholdings on land suitable for agricultural purposes: 5–8ha
Residential smallholdings on marginal land: 3ha

**Settlement**
Restrict settlement rights to those applicable to agricultural land in rural areas. Specific local circumstances (such as the availability of household services), that varies from area to area within the Municipality, should inform the settlement conditions to be applied to each area and individual projects.

**Commonages**
Commonages should not be alienated or fragmented as they provide opportunities for new entrants into the farming sector. These public land resources can be used effectively as a tool for local economic development and only those areas not suitable for farming should be considered for alternative public uses such as active or passive recreation. The ability of the Saron commonage to support small-scale agricultural activities must be investigated, as there is a consistent demand by historically disadvantaged individuals and groups for access to farming land.

**Service Delivery and Cost Recovery**
The costs of providing municipal services at an appropriate level must be a consideration in the establishment of agricultural holdings in the urban fringe. Immediate development costs as well as long-term operational and maintenance costs can greatly reduce the feasibility of agricultural activities in the fringe areas.

The general purpose of a Spatial Development Framework (SDF), as part of an Integrated Development Plan / Framework, shall be to indicate the spatial implications of the IDP and lay down strategies, proposals and guidelines for the future spatial development of the area to which it relates (including, without being limited to, development objectives, proposals for land reform, urban renewal, reconstruction, integration, environmental planning, transport planning, infrastructural planning and urban design and the general well-being of the particular community and orderly planning of the area be promoted in the most effective manner.

**Densities**
“The average residential density in urban settlements should be increased to 25 du/ha within 10 years. This implies that densities may be appropriately low at 3-6 du/ha on the urban periphery but should increase to 40-60 du/ha at the core”

“Densification of urban settlements should occur with due regard for environmental and heritage concerns as identified in EIAs / HIAs”.
A broad-brush overall spatial framework for the Drakenstein Municipality \(^\text{13}\)

Application of the Spatial Planning Categories (SPC's) in the Drakenstein Municipality is indicated on Figure 6. It is important, however, to note that the categories have been allocated in a “broad-brush” manner in accordance with the predominant land uses and that pockets within each specified category may be delineated, after detailed study, as of a higher or lower order category. As is evident from the Status Quo Report (Volume 1 of this Report) the largest proportion of land in the municipality is categorized under the higher order SPC’s of Category A (Core area incorporating Wilderness areas and other statutory conservation areas), Category B (Buffer area, incorporating public and private conservation areas, ecological corridors/areas and rehabilitation areas) and Category C (Transition area, incorporating intensive and extensive agricultural areas).

The urban areas are all demarcated as Category D (urban-related) areas with Paarl, as the administrative centre, categorized as Db (main local town) and Wellington, Gouda and Saron as Dc (local town). The major settlements of rural communities across the municipal area (Hermon, Simondium, Windmeul) are categorized as Dd (rural settlement) or Df (on-farm settlements).

Development in the smaller towns should not be aimed at competing with the economic and administrative capacity of Paarl, but rather to address the socio-economic requirements of their inhabitants and those of the surrounding farmlands.

Table 1 hereunder, lists the various Spatial Planning Categories and Sub-Categories and gives an indication of the Zoning Scheme Use Zones that can be accommodated within each. Specific areas for the conservation of biodiversity and indigenous vegetation within this broad categorization will be identified in conjunction with Cape Nature Conservation.

\(^\text{13}\) Strategic Environmental Assessment for the Drakenstein Spatial Development Framework, EnviroDinamik, September 2005
Figure 6: Broad-Brush Overall Spatial Framework Bioregional Planning Concept
<table>
<thead>
<tr>
<th>SPC</th>
<th>SPC: Sub-Categories</th>
<th>Zoning Scheme Use Zone(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.a</td>
<td>Existing formal protected areas, state or private</td>
<td>Conservation Zone 1 (CON 1)</td>
</tr>
<tr>
<td>A.b</td>
<td>Priority natural habitat: Critically endangered natural habitat, special habitats (e.g. wetlands, silcrete patches) and endangered natural habitat</td>
<td>Conservation Zone 2 (CON 2)</td>
</tr>
<tr>
<td>A.c</td>
<td>Rivers</td>
<td>Conservation Zone 2 (CON 2)</td>
</tr>
<tr>
<td>B.a</td>
<td>Ecological corridors / areas</td>
<td>Conservation Zone 3 (CON 3)</td>
</tr>
<tr>
<td>C.a</td>
<td>Extensive agricultural areas</td>
<td>Agricultural Zone 1 (AGRI 1)</td>
</tr>
<tr>
<td>C.b</td>
<td>Intensive agricultural areas</td>
<td>Agricultural Zone 1 (AGRI 1)</td>
</tr>
<tr>
<td>D.a</td>
<td>Metropolitan City / District town</td>
<td>Single residential Zone 1 – 4, General Residential Zone 1 – 4, Business Zone 1 – 5, Commercial Zone 1 – 3, Authority Zone 1 – 2, Transport Zone 1 &amp; 3, Open Space Zone 3 – 5, Rural Zone 1.</td>
</tr>
<tr>
<td>D.b</td>
<td>Main local town</td>
<td>As for D.a above</td>
</tr>
<tr>
<td>D.c</td>
<td>Local town</td>
<td>As for D.a above</td>
</tr>
<tr>
<td>D.d</td>
<td>Rural Settlements</td>
<td>Rural Zone 2 (RU 2)</td>
</tr>
<tr>
<td>D.e</td>
<td>Institutional settlements</td>
<td>Rural Zone 2 (RU 2)</td>
</tr>
<tr>
<td>D.f</td>
<td>On-farm settlements</td>
<td>Rural Zone 2 (RU 2)</td>
</tr>
<tr>
<td>D.g</td>
<td>Farmsteads</td>
<td>Primary Use – AGR 1</td>
</tr>
<tr>
<td>D.h</td>
<td>Resorts &amp; Tourism related areas</td>
<td>Resort Zone 1 (RE 1)</td>
</tr>
<tr>
<td>D.i</td>
<td>Other Urban-related areas</td>
<td>Single Residential Zone 1 – 4, General Residential Zone 1 – 4, Business Zone 1- 5, Commercial Zone 1 – 3, Authority Zone 1 – 2, Transport Zone 1 &amp; 3, Open Space Zone 3 – 5.</td>
</tr>
</tbody>
</table>
Annexure 18: Densification and Urbanisation Strategy and Open Space Utilization Policy

The purpose of the study was to evaluate to what extent there was capacity for additional urban development in the urban settlements of Drakenstein Municipality, particularly Paarl and Wellington. The study was also required to evaluate the open space within the settlements with a view to whether this open space should be retained or used for urban development (Drakenstein Municipality 2006).

Population Growth and Urbanisation

The study first overviewed the urbanisation challenge facing Drakenstein. It found that according to the 1996 and 2001 Censi the growth rates of Drakenstein municipality were relatively low, being approx 2.5 % in total over the five year period 1996 – 2001. Preliminary indications from the housing department and other departments agree with this trend. One way of checking urbanisation trends is to examine the consumption of urban services such as water. However, Drakenstein Municipality has had extraordinary success with its water conservation measures which are now down to 1990 levels. This makes it difficult to use water consumption as a proxy for urban growth.

Limitations

Important limitations relating to the study arise from its rapid duration and its reliance on primary data sources such as the 1996 and 2001 Censi. Detailed work on a sub-district by sub-district basis may reveal differences to these figures arising from recent development projects.

Housing Backlog

An important opportunity presented by an urbanization strategy is to address current backlogs that urban settlements may be facing with regards to housing and other forms of development. Research is still being completed reconciling the various estimates of housing demand in the Drakenstein area prepared by the municipality and the Cape Winelands District Council.

To resolve this issue the municipality has identified a low income housing delivery target, to be achieved within the next five years, of 6000 housing units. The extrapolated population growth rates suggest that between 10000 and 17000 or between 2300 and 4000 households from all income groups will need to be accommodated by 2011. These figures do not include those who may move in from outside of the area.

According to the 2001 Censi approximately 57 % of people in Drakenstein can be considered low income (less than R3200 household income per month), 19 % in the medium income group and 24 % in the high income group. This suggests growth of between 1400 and 2400 new low income households, 470 – 800 middle income households, and 600 – 1000 high income households. When these figures for future growth are added to the existing backlog target an overall housing and urbanization challenge for the period 2001 – 2011 can be summarized as follows:

For the low income group between 7400 and 8400 units, medium income 470 – 800, and high income 600 – 1000 units, giving a total of between 8500 and 10200 units. This housing demand represents an opportunity for the restructuring of the Drakenstein urban settlements by guiding the necessary development in ways that will integrate and consolidate the urban structures of the settlements. Three points should be made in this regard:

Firstly, little is known about the amount of farm workers that is likely to leave the farms in the short and medium term as a result of the implementation of the Establishment of Security of
Tenure for Farm Labourers Act. Indications are that the impact of this act is accelerating rural urban migration to the nearest urban settlement.

Secondly, it is clear that the challenges lie primarily with accommodating the backlog rather than future growth and that this backlog is mainly focused on the low income groups.

However, there is an increasing concern about the shortage of middle income housing as opportunities for this part of the market are being crowded out by high income and public housing projects.

**Densification and Open Space Utilisation Principles**

The study identified three important principles by which densification and restructuring should be approached.

First, with regards to integration of urban activities 50% of such activities should be within walking distance of where people live. It can be seen that implementing such a principle will encourage a far higher level of mixed use within urban areas than has currently been the case where there has been a large reliance on public or mainly private transport to enable people to commute between their residences and other destinations.

Secondly, the principle of a socio-economic gradient has been identified as being extremely important in ensuring a smooth transition from the current highly separated apartheid pattern to a much more integrated layout. This principle states that while it is important that there is a complete range of socio-economic groups within walking distance of each other in an urban settlement or components in a large one it is important that the detailed interface between various community groups respects the principle of a gradient whereby abutting communities do not have too great a gap in the level of living and norms and standards between those living near each other. This important principle attempts to address the issues of community kinship ties, “nimbism”, objections and court actions, and redlining and devaluing of properties by banks and other financial institutions.

The third principle relates to the pattern of densification and states that a minimum gross average dwelling units density of 25 du/ha should be achieved if urban settlements are to become efficient and convenient. Below these densities it is very difficult for public transport to be effectively supported, for urban services to be viably rendered for there to be strong thresholds to support small business, and for there to be sufficient support of community facilities so that they are well used and do not represent “white elephants”.

It should be noted that this is an average pattern and is not intended to be applied uniformly throughout an urban settlement. Rather there should be a pattern of low densities, as low as 4 – 8 du/ha on the periphery which often forms an appropriate interface with surrounding farmland and natural areas, while in central, highly accessible areas densities should increase to 60 or even 100 du/ha so that there are as many people as possible to take advantage of their locational opportunities in these areas.

It is important to note that such a densification strategy does not imply high rise buildings. These densities can be achieved with a maximum of 3 – 4 storey buildings in the core areas declining to double and single storey buildings towards the peripheries.

**Existing Policy Frameworks**

There are a number of existing policy documents which the urbanization, densification and open space policy has to take into account.
The first of these is the Western Cape Provincial Spatial Development Framework (WCPSDF). The WCPSDF intends to ensure that the province and its urban settlements move on to a sustainable basis with regards to their consumption of services and their ability to provide livelihoods and housing for all. This requires the effective implementation of a number of policies which to date have been identified but not strictly applied. In particular, the WCPSDF encourages the densification of urban settlements and the breakdown of apartheid patterns. It encourages the maximum use of well located public space for economic activities and community facilities. It also identifies the benchmark of an average gross density of 25du/ha as having been revealed in local and international studies as the density threshold at which settlements become significantly more viable.

The Winelands SDF identifies Paarl and Wellington as primary investment nodes and capital infrastructure focus areas. It notes that they are located in sensitive areas of intensive agriculture and that there should be urban edges delineated around them.

The Drakenstein SDF notes the importance of well located low income housing, the discouragement of development outside of the urban edge such as golf estates, the importance of heritage management in the context of Paarl and Wellington, the need for biodiversity conservation especially along the Berg River and its tributaries, and that with respect to traffic and transport there should be a move towards promoting non-motorised forms of transport such as walking and cycling so as to lessen the transport costs, lessen pollution and similar problems, and to generally make the towns more convenient and easy to live in especially for the urban poor.

The SDF identifies the need to try and integrate especially Paarl across the Berg River between west and east by extending a number of key activity routes to achieve this. The Drakenstein Urban Edge Policy is an important adjunct to the densification and open space policy as it identifies the boundaries in which these two aspects of the urban settlements must be investigated. The main purpose of the urban edge is to protect visually sensitive areas, areas of important biodiversity, and agricultural activity. The proposed line around the settlements of Wellington and Paarl provides for an additional approximately 230ha land.

An analysis of densities in the Paarl and Wellington areas reveal a pattern that can likened to a doughnut whereby there are high densities, mainly in low income housing settlements on the periphery whereas the urban cores of these two settlements are relatively low. In general, existing densities are around between 8.5 to 9du/ha. This is far below the international benchmark of 25du/ha. There is quite a considerable range in densities across different suburbs. High income low density suburbs average gross densities are as low as 2 and 4du/ha. There are series of medium density suburbs with middle to lower-middle income residents with densities of approx 15 – 17du/ha. There are recently developed low housing schemes where densities are in excess of 40du/ha.

It is interesting to note that the densities of the former white suburbs and the former coloured suburbs are similar to those densities that were laid down in the Guide Plan of 8du/ha and 15du/ha for coloureds. Densities for African areas were pegged at 22du/ha. Therefore, it can be appreciated that moving the average gross densities of the settlements from 9du/ha to 25du/ha constitutes a major restructuring of the settlements. However, it should be remembered, as stated earlier, that this does not require a move to inappropriate high rise buildings and that much can be achieved with low and medium rise buildings laid out in a different configuration to that of the past.
**Constraints**

A number of constraints have to be taken into account when assessing the capacity of a settlement to accommodate more development. These settlements include existing vacant land and open space requirements. The municipality already have an inventory of much of the space on its GIS database which was taken into account.

Heritage is an extremely important factor in the settlements of Paarl and Wellington. A team of heritage experts identified areas in Paarl mainly along the main road and the berg river and in Wellington also along the main road as well as the gateways into Wellington where development should be very sensitively and carefully permitted.

For the purposes of this study the heritage areas were treated as no-go areas. However, sensitive intensification of development with very careful urban design and conservation guidelines would be possible.

Rivers and wetlands are an important biodiversity resource which have suffered considerable destruction over the past decades of urban development. This is raising a number of water quality and quantity issues as well as safety regarding floodlines and building setbacks. Accordingly the 1:50 and 1:100 year floodlines along the Berg River and its tributaries were mapped as absolute urban development constraints. Important open spaces to be retained such as New Orleans Park and the town gardens in Paarl and Wellington were also identified.

A key constraint with regards to increasing urban development is the availability of civil engineering services. The main services constraint in Drakenstein relates to sewage treatment. The Wellington waste water treatment work is at capacity and required extending whereas the Paarl waste water treatment works still has excess capacity. On the other hand the reticulation networks in Wellington have sufficient capacity to absorb more development whereas this is not the case in parts of Paarl. However, even in these areas it is not necessary to upgrade the entire networks where there is capacity to be found in the “capillaries” but at certain key intersections on the main linking services. Increasing the capacity of these key links will enhance the capacity of the network as a whole.

Transportation is also an important input, particularly if private motor vehicles are going to continue as a predominant form of transport increased urban densities will result in unacceptable traffic congestion. However, the increased densities also provide thresholds by which public transport can be made more viable. Therefore, it is important that the transport plan and the urban densification and urbanization strategy are closely aligned so that they are mutually supporting. In this regard, it is also important to review the road access management guidelines of the major arterial roads in Paarl and Wellington. These are currently designed to maximize mobility and limit access for business pedestrians and non-motorised transport. These road access management guidelines need to be reviewed so that these roads’ proper role as distributors of economic activity by transport can be properly addressed. It is in this regard that it is proposed that the road cross sections are amended so that they can accommodate both mobility and access requirements along their length.

**Implementation “Tools”**

In order to implement the densification and open space strategy six “tools” were identified.

1. The no-go strategy which should be applied in areas for heritage, open space and amenity, biodiversity, or agricultural conservation where development would be inappropriate.
2. Demolition and redevelopment refers to well located areas, for example a piece of public open space, which should not be developed because of its value which will grow into the future as more and more people move into the area. In these instances permission should be given to abutting plots to redevelop the properties to higher densities, e.g. semi-detached or town houses, so that as many people as possible are able to take advantage of the open space. This can also be applied in well located areas were there may not necessarily be open space but large low density plots representing a considerable under-utilisation of such land. Obviously, constraints such as heritage and other concerns must be taken into account.

3. The infill tool relates to well located land within urban settlements that does not have a recreational amenity value and may encourage anti-social behaviour. Such open space can be redeveloped with high density buildings which ensure that positive open spaces are created.

4. On very large plots with large buildings, subdivision of those properties or their conversion into second dwellings or into sectional titles apartments may be appropriate.

5. Greenfields development refers to the traditional pattern of development where large tracts of vacant land, generally on the urban fringe and often formally productive farms is converted into urban townships.

6. Brownfields development refers to the use of land that may formally have been used for transport or utility services and is no longer required for these purposes. Such land is often derelict but very well located and providing the required remedial measures can be taken to make the land suitable for development represent excellent opportunities for densification.

Concepts
As mentioned earlier the proposals for the densification of Paarl focus only on those sub-districts where densities are lower than 25du/ha and which have not been identified as having heritage value by the heritage specialists. Conceptual urban design frameworks have been developed for Paarl and Wellington focusing on major roads that could perform as activity spines and streets encouraging a large mix of urban opportunities, particularly economic activity and employment, as well as urban areas where more development would be appropriate. These conceptual drawings also omitted areas identified as sensitive from a heritage aspect.

There are five principles in formulating the densification strategy:

- Densify along major routes;
- Densify vacant and under-utilised areas;
- Avoid “town cramming”;
- Preserve well located spaces; and,
- Promote socio-economic integration.

These proposals give rise to the map showing areas where the full densification tools should be applied. The study revealed that an additional 13000 units could be accommodated in Paarl and 3700 in Wellington. This gives a total of approx 17000 units which can be compared to the approximately 8500 identified as part of the need facing the two settlements, see Table 1.

Table 1: Development Potential in the Study Area: Existing and Proposed Dwelling Units
It should be noted that this proposed increase in the number of units only increased Paarl and Wellington’s average gross densities to 12du/ha. Although this represents a 50% increase on current densities it is still far short of the threshold where significant efficiencies in Paarl and Wellington can begin to be realised.

This suggests there is still scope for significant increased in densities in Paarl and Wellington before it will be necessary to expand the Urban Edge on these criteria.

Table 2 breaks these totals down in terms of low, medium and high income as currently pertaining to the sub-districts. It should be noted that no attempt has been made at this stage to look at the integration of different income groups within the sub-district of a other group. This is an important step that needs to be taken by Council. Table 2 reveals that there would appear to be considerable capacity for more urban development, mainly in the form of housing, in the current medium income areas, whereas the largest demand for housing is from low income residents. This immediately suggests the need for some kind of socio-economic integration in order to align the land that is available with addressing the need where it is positioned socio-economically.

Table 2: Development Potential in the Study Area: Proposed Units in Income Group Categories

<table>
<thead>
<tr>
<th></th>
<th>Wellington</th>
<th>Paarl</th>
<th>TOTALS</th>
<th>Need/ Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1088</td>
<td>1652</td>
<td>2 740</td>
<td>7336</td>
</tr>
<tr>
<td>Medium</td>
<td>1659</td>
<td>9168</td>
<td>10 827</td>
<td>437</td>
</tr>
<tr>
<td>High</td>
<td>1011</td>
<td>2144</td>
<td>3 155</td>
<td>553</td>
</tr>
<tr>
<td>TOTALS</td>
<td>3758</td>
<td>12 964</td>
<td>16 722</td>
<td>8326</td>
</tr>
</tbody>
</table>

Case Studies
A number of case studies were developed on land in different suburbs in different contexts to demonstrate how projects might practically be implemented to give effect to the densification and urbanization strategy. These are detailed in the full report.

Implementation and Conclusion
With regards to implementation there are many sites that have been identified which could be developed immediately either by the public or by the private sector.

For the implementation of the proposals as a comprehensive urban renewal strategy throughout Paarl and Wellington, the following steps have been identified:

1. Research the extent of the likely movement of farm labourers to the nearest urban settlements;
2. Conduct public participation on a sub-district by sub-district basis. This will have a two-fold purpose to enable residents to have an input into possible changes in their neighbours as well as to inform them of potential development opportunities that they may wish to take advantage of;

3. The density analysis should be rerun on civil engineering services, sub-districts and transport planning zones to evaluate the impact of the densification proposals on available capacities;

4. The capacity of civil engineering services must be assessed so that areas where development can occur immediately and where further augmentation of the services necessary can be identified and the necessary funding procured and the upgrading projects implemented; and,

5. The transportation plan should be revised so that it aligns with the proposed densification open space strategy.

With regards to implementation Table 3 indicates how the proposals might be implemented on public and private land.

**Table 3  Implementation of Proposals on Public and Private Land**

<table>
<thead>
<tr>
<th>STRATEGY / &quot;TOOL&quot;</th>
<th>PUBLIC</th>
<th>PRIVATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-go</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POS</td>
<td>Retain, develop and maintain</td>
<td>Acquire for public ownership through purchase or cession as part of development approved or zone as private open space with maintenance responsibility</td>
</tr>
<tr>
<td>Demolition and Redevelopment</td>
<td>Put sites out to tender, JV, or proposal call</td>
<td>Approve applications for rezoning, demolition according to densification strategy overlay zones</td>
</tr>
<tr>
<td>Infill</td>
<td>Put sites out to tender, JV, or proposal call or use for public subsidy or social housing project</td>
<td>Approve applications according to densification strategy overlay zones</td>
</tr>
<tr>
<td>Subdivision, Second Dwellings, Sectional Title</td>
<td>n/a</td>
<td>Approve applications according to densification strategy overlay zones</td>
</tr>
<tr>
<td>Greenfields</td>
<td>Put sites out to tender, JV, or proposal call or use for public subsidy or social housing project</td>
<td>Approve applications according to densification strategy overlay zones</td>
</tr>
<tr>
<td>Brownfields</td>
<td>Put sites out to tender, JV, or proposal call or use for public subsidy or social housing project</td>
<td>Approve applications according to densification strategy overlay zones</td>
</tr>
<tr>
<td>STRATEGY / &quot;TOOL&quot;</td>
<td>PUBLIC</td>
<td>PRIVATE</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>subsidy or social housing project. Ensure sites are cleaned of toxic waste and any other hazards.</td>
<td>Ensure sites are cleaned of toxic waste and any other hazards.</td>
<td></td>
</tr>
</tbody>
</table>
Annexure 19: Draft Cape Winelands District Municipality Spatial Development Framework

MCA Planners has recently completed an Analysis, Assessment and Prioritisation Report (Phase 2) as part of the process of compiling a Spatial Development Framework (SDF) for the Boland District Municipality. The completion of this phase will provide the base for the next phases of policy formulation and implementation. The Phase 2 document identified growth management and economic development as primary concerns for planning at a regional level. The Cape Winelands District Municipality Spatial Development Framework (CWDM SDF) contains the following guidelines:

“Biophysical strategies and policies

- Protection and sustainable management of natural and built resources. Critical questions to be asked include:
  - Where should development not go, the fixes in other words. This involves establishing regional environmental constraints (such as fault lines, flood plains, slope and clay) and assets (agricultural land, river corridors, mountains) as fixes;
  - Where development should be encouraged and intensified.

- Hamlets: The social and economic viability of further urban development in smaller settlements and rural areas. A critical requirement is however that these hamlets must be economically sustainable;

- Intra town: The form and structure within the local towns, villages and hamlets in terms of the quality of the urban environments and how access to opportunities could be encouraged and promoted.

- With regard to facilitating urban environments which have the appropriate form and structure, the following principles should guide regional policy:
  - Promotion of high quality and integrated urban environments;
  - Strategies to integrate separated neighbourhoods within local towns;
  - Containing urban sprawl and defining the urban edge;
  - Urban intensification and densification as a tool to promote urban renewal and economic investment;
  - Redressing imbalances in terms of facilities and services;
  - Ensuring adequate access to housing;
  - Investigating the use of strategies such as activity streets, nodes and open space systems at a B-municipality planning level, as a means of achieving the above.
Annexure 20: Manual for the application of Bio-regional Planning in the Western Cape Province

The overarching Drakenstein Municipality SDF is based on the principles of bioregional planning contained in the Manual for the application of Bio-regional Planning in the Western Cape Province, which is a useful model for land management, with the emphasis on sustainable development.

The Framework introduces the concept of biosphere reserves nominated by national government and fulfilling three complementary functions:

- a developmental role promoting economic and human development that is socio-culturally and ecologically sustainable;
- a logistical role that includes networking on a world-wide scale for research, environmental education and training and monitoring; and
- a conservation role to conserve biodiversity, ecosystems and genetic material (Dennis Moss Partnership Inc, October 2003).

The concept is based on a structure of interrelated zones covering the entire planning area with land uses and conservation status assigned to each zone. The Framework puts forward a model biosphere reserve as containing three elements:

- A core area with statutory protection for conservation and allowing only "non-disruptive, non-consumptive" land uses such as outdoor recreation and environmental education (definition: a defined natural area of conservation importance);
- A buffer area surrounding the core area protecting it against consumptive human activity. This area is used for "co-operative non-consumptive activities" including eco-tourism and research (definition: a defined natural area surrounding the core area); and
- A transition area that includes a variety of activities such as agriculture, settlement development and other disruptive land uses (definition: defined zones surrounding the buffer zone, representing the development areas) (Dennis Moss Partnership Inc, October 2003).

Bioregional Planning, according to the Manual for the application of Bioregional Planning in the Western Cape Province, is "an organized process that enables people to work together, think carefully about potential problems of their region, set goals and objectives, define activities, implement projects, take actions agreed upon by the communities, evaluate progress and refine
their approach”\textsuperscript{14}. The promotion of sustainable development practices requires planning and management systems “which would facilitate a balanced integration of conservation and development interests in land use and settlement planning”\textsuperscript{15}. The biosphere reserve model provided a basis for developing Spatial Planning Categories (SPC’s) and the framework proposes that “the SPC’s be applied for all landuse classification at all levels of planning in the Western Cape” (Dennis Moss Partnership Inc, October 2003), including the preparation of Integrated Development Frameworks, sectoral plans and spatial plans.

Table 1: Spatial Planning categories (SPC’s)

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>DESCRIPTION</th>
<th>BASIC PURPOSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category A</td>
<td>Core Area (Consistent with UNESCO’s Biosphere Reserve ‘Core Areas’).</td>
<td>Comprising areas of high conservation importance that must be protected from change. Only non-consumptive landuses may be allowed conditionally.</td>
</tr>
<tr>
<td>Category B</td>
<td>Buffer Area (Consistent with UNESCO’s Biosphere Reserve ‘Buffer Zone’).</td>
<td>Serving as a buffer between Category A Areas and Category C Areas. Sustainable small-scale development and non-consumptive landuses may be allowed conditionally.</td>
</tr>
<tr>
<td>Category C</td>
<td>Agricultural areas (Consistent with UNESCO’s Biosphere Reserve ‘Transition Zone’).</td>
<td>Constituting rural areas where extensive and intensive agriculture is practiced. Including forestry areas.</td>
</tr>
<tr>
<td>Category D</td>
<td>Urban-related areas (Consistent with UNESCO’s Biosphere Reserve ‘Transition Zone’).</td>
<td>Representing a broad spectrum of nodal urban-related settlements and associated services and infrastructure.</td>
</tr>
<tr>
<td>Category E</td>
<td>Industrial areas.</td>
<td>Representing the industrial areas where the highest intensity of human activity occurs.</td>
</tr>
<tr>
<td>Category F</td>
<td>Surface infrastructure and buildings.</td>
<td>Constituting all surface infrastructure and buildings not catered for in the above categories. Including roads, railway lines, power lines, communication structures, etc.</td>
</tr>
</tbody>
</table>

Source: Manual for the application of Bioregional Planning in the Western Cape Province, Dennis Moss Partnership Inc, October 2003

To provide for more detailed planning, the above SPC’s are divided into 32 sub-categories as well as a ‘conservation hierarchy’ illustrating the relative conservation importance and permissible landuse intensity in each category. In the Provincial Government of the Western Cape’s Bioregional Planning document it is suggested that bioregions be delimited that would...
encapsulate biophysical, biological and socio-economic considerations consistent with the definition of bioregions. It is proposed that a ‘hierarchical delimitation process’ be adopted, which recognises both diversity and scale.

Breaking New Ground was approved by the Cabinet of the Republic of South Africa in September 2004 as a new national policy on housing provision and moves away from the emphasis on delivery of houses to the creation of sustainable human settlements. The policy that poor location of and the absence of supporting community facilities in housing projects since 1994, has entrenched historical patterns of housing delivery.

The policy promotes the achievement of a non-racial integrated society through the establishment of sustainable human settlements and the creation of quality housing. This places a particular responsibility on local authorities to ensure the use of well-located land for the provision of housing and the spatial restructuring of historically segregated towns and villages. The Drakenstein SDF should therefore give specific attention to issues such as the use of a variety of housing typologies, densification, urban renewal opportunities and the clustering of facilities in relation to residential development.
Annexure 22: Guidelines for the Management of Development on Mountains, Hills and Ridges of the Western Cape

These guidelines apply to a range of topographical features including mountains, hills and ridges and establish where development should be avoided and where it can be considered under specific conditions. The policy sets out criteria to guide the form and type of development where this can be considered and puts forward an application procedure.

The guidelines stipulate that development outside the urban edge is considered inappropriate and should be avoided and where such an edge is not defined a development line, outside of which development will not be encouraged, must be determined. No-go areas determined in this manner will be further defined on the basis of their environmental sensitivity and spatial planning categories (spc's) must be applied to determine where development can and cannot go. Environmental sensitivity should be determined in accordance with the following key indicators as set out in the policy:

- steep slopes (more than 1:4)
- mountain crests, hills or ridges;
- declared mountain catchment areas;
- locations on mountains, hills or ridges that serve as sources of water;
- areas with sensitive fauna and flora; and
- areas of cultural significance
Annexure 23: Policy Guidelines for Golf Course and Polo Field Developments in the Western Cape

The proliferation of Golf Course and Polo Field developments across the Western Cape Province has necessitated the Provincial Government to launch an investigation into these types of developments. These developments are typically located on the periphery of towns where they capitalise on the scenic attributes and access to nature areas provided by such location.

A number of concerns are raised by the study in respect of the location of these developments as the location of these low density residential developments creates an efficient pattern of development and impacts negatively on visual, heritage, agricultural and natural resources. The socio-economic impact on affected communities is also raised as a concern.

The guidelines therefore recommend that such developments be located within the urban edge and that they may be considered outside the urban edge under the following circumstances:

- the development will result in achieving long-term biodiversity goals (the development takes place on degraded or disturbed land which is not deemed as being of conservation significance and will result in the rehabilitation and ongoing maintenance of a significant land parcel/habitat/natural resource; and/or
- where socio-economic imperatives are such that consideration of development is warranted; and/or
- the development will result in securing the viability of a significant agricultural unit or contribute significantly to land reform objectives.

Such development will, however, be subject to strict conditions relating to, amongst others, impact on biodiversity resources, water usage and visual impact. Over and above this, the study recommends a move away from creating gated communities and requires that a mix of income groups be considered in the formulation of development proposals.
Annexure 24: Drakenstein State of the Environment Report (SoE)

The Drakenstein State of the Environment Report was drawn up as a parallel process to the SDF process to provide background information and guidance in respect of future spatial development within the municipality. The results of this study are incorporated in this report.

The main purpose of a state of environment (SoE) report is to summarize the current state of the natural and social environments. The information contained in a SoE report enables us to understand how our environment is changing, for example, are the trends showing that environmental conditions are getting better or worse? A SoE report highlights what effects people are having on our environment. This information can then be used to identify what actions need to be implemented to improve the condition or status of the environment. The SoE report identifies indicators that help us in measuring/monitoring whether the state of the environment is improving or getting worse. The indicators help to illustrate whether our actions or responses to environmental change are resulting in improved conditions. State of Environment reports provide information to helps us to make better decisions about how we should be living in and managing our environment.

The word ‘environment’ can have a broad meaning. The National Environmental Management Act (NEMA) Act No. 107 of 1998 defines the ‘environment’ as:

“the surroundings within which humans exist…that are made up of the land, water and atmosphere of the earth; micro-organisms, plant and animal life; any…interrelationships among and between them and the physical, chemical, aesthetic and cultural properties and conditions that influence human health and well-being.”

A SoE report typically includes information on:

- The condition of the environment and natural resources, including information on environmental issues and trends in environmental quality.
- The causes of environmental change.
- The impacts on the environment.
- What authorities and individuals are doing to improve environmental conditions, whether actions are effective and what more could be done.

What is Sustainable Development?

Sustainable development refers to development that aims for equity within and between generations; and adopts an approach where the economic, social and environmental aspects of development are considered in a holistic fashion.

The three fundamental characteristics of a SoE report are:

- To analyse and present environmental information that can be used to assist planning and management.
- To show changes in environmental conditions over time and space.
- To show the linkages between biophysical and socio-economic functions within the context of sustainable development.
The structure of the SoE report
This SoE uses the ‘DPSIR’ reporting system that describes environmental issues in terms of the following categories:

Driving forces
These are usually underlying social and economic activities that lead to environmental change. Population growth, poverty, agriculture and industrial production are common examples.

Pressures
These are pressures on the environment that result from the driving forces, for examples: pollution of air, water and soil from industrial production; or depletion of fish stocks through human consumption.

State
This section describes the current state of the environment and recent trends in environmental quality.

Impacts
These are the consequences of the pressures on the environment, for examples: reductions in biodiversity, soil degradation, poor human health, and lack of clean, safe water.

Response
This section describes the human responses to environmental change, including policies and management strategies to reduce environmental damage, rehabilitate damaged environments, and encourage sustainable development.

An example of the reporting system is illustrated in the diagram below using the theme of fresh water resources.

The state of the environment is described using environmental indicators. Indicators are specific measurements or records that are taken to assess and monitor environmental conditions. Indicators are used to present large amounts of detailed information in a format that is easy to understand. For example, if one wants to measure water quality (e.g. how fit the water is for drinking), one could measure the amount of substances it contains that are not good for human health. If measured over time, we would know whether the water quality is improving or getting worse. Likewise, measurements from two different areas will tell us whether the water in one river is being managed better than the other. Indicators are also useful for benchmarking environmental performance.

An environmental indicator should:

- Provide a representative picture of environmental conditions, pressures on the environment or society’s response;
- Be simple, easy to interpret and able to show trends over time;
- Be responsive to changes in the environment and relate to human activities;
- Have a target or threshold against which to compare it so that users are able to assess the significance of the values associated with it;
- Be theoretically well founded in technical and scientific terms;
- Be based on international standards and international consensus about its validity; and
- Lend itself to linkage with economic models, forecasting and information systems.
The use of the DPSIR framework in the Drakenstein SoE report

In the Drakenstein SoE report, the DPSIR framework has been used but slightly restructured. Each of the 15 themes (or issues) covered in the SoE report starts with a brief overview of the theme. This is followed by a section which identifies the key driving forces and pressures that bring about the various impacts. The state of the environment is then described, using a variety of indicators. The responses needed and/or currently underway are noted in a table which also gives an indication of the priority assigned to the issue to be addressed. Two additional sections added to the Drakenstein SoE report are: a list of the key legislation relevant to the theme under discussion, and a section which identifies any key information gaps. These are highlighted so that the municipality can decide whether they wish to address these information gaps. Each section is completed with a reference list of documents and sources of information used in that section. As information has been gathered from a wide variety of places, the location of the documents internal to or belonging to the municipality has been specified. This has been done in order to help people seeking more detailed information to source the relevant documents.

**Water**

Water is a valuable resource in South Africa, where low rainfall and high evaporation rates mean that the levels of rivers and dams cannot be maintained all year round. However, there is increasing demand for water from our growing population and its wide range of economic activities. Such intense pressure tends to result in depletion of water sources, and their degradation due to pollution.

The establishment of informal areas without access to basic services has contributed to the pollution problem of the water sources. All legal households get the same standard of water in terms of government policy and the access to water has been addressed and distributed more equitably over the years as well. Only the illegal informal settlements receive minimum service in terms of government policy.

Industrial and agricultural activities place additional strain on the resource, as they use vast quantities of water and discharge pollutants, which may reduce surface and groundwater quality and impact aquatic ecosystems. Effluent and runoff containing high levels of nitrogen and phosphorus, as found in detergents, fertilizers and organic waste, typically causes nutrient enrichment – called eutrophication – that results in excessive growth of aquatic plants, especially nuisance algae and water hyacinth.

The Drakenstein Municipality falls within a winter rainfall region, where river flow is highly variable. The Berg River frequently floods during winter - inundating low-lying areas of farmland - but low flows are typical during the hot, dry summer months.

**The current state**

- The Drakenstein Municipality receives more than 90% of its water from the Wemmershoek and Vöelvlei Dams, operated by the City of Cape Town. This water is generally of a high quality. Paarl’s remaining needs are met by runoff collected in the Nantes and Bethel Dams on Paarl Mountain, together with water pumped from the Berg River to the Paarl Mountain water treatment plant, which is being upgraded to improve water quality. Saron relies on an earth dam to supply drinking and irrigation water, but this is insufficient to meet current needs. There are 24 reservoirs in the Drakenstein urban areas - 14 in Paarl, 6 at Wellington, 2 at Saron and one each in Gouda, Hermon, Bainskloof and Pearl Valley.

River Environmental Management Plan: Drakenstein Municipality
A recent study on the Berg River system in the Drakenstein Municipal area revealed that the system is highly polluted and significantly altered from its natural state. The only part that is still in a near-pristine state is the upper catchment of the Twenty-four River. Alien vegetation infestation and agricultural activities impair the ecological integrity of most of the tributaries, while urban development has reduced water quality and natural habitat in the Berg River and lower reaches of the tributaries. In the Klein Berg and Twenty-four Rivers, flow patterns have been altered by diversion weirs.

Water quality problems are the cumulative effect of pollutants from a variety of sources, including nutrient enrichment resulting from runoff from farmlands and golf courses, and discharge of treated sewage effluent, pollutants from water runoff in informal settlements next to water sources, rivers and storm water runoff. The contribution of toxic pollutants from sources such as crop sprays, cattle dips and industrial effluent is currently unknown.

The various Waste Water Treatment Works - Paarl, Wellington, Pearl Valley Golf Estate, Drakenstein Prison, Gouda and Saron – discharge effluent that generally meets the required standard in terms of bacterial counts. Nevertheless, there is significant faecal contamination of the Berg River, which can be attributed to stormwater runoff from informal settlements in the Paarl-Wellington area, and periodic overflows from the pump station at the Wellington Water Treatment Works. This poses a health risk for direct-contact recreation, such as swimming and canoeing.

There is also a health risk associated with the irrigation of agricultural crops using sewage-contaminated water. In addition, pH values have been increasing to the south and north of Paarl, and the Leeu River may now be too acidic for irrigation use. Water in the Kompanjies River sometimes exceeds conductivity targets, while increasing sodium adsorption ratio (SAR) values on the Klein Berg River in summer indicate that soil salinisation may become a problem in future.

Communities of aquatic invertebrates in the Berg River have been significantly impacted through pollution and other disturbances. Dissolved oxygen concentrations are below the recommended level of 80% saturation for a large proportion of samples collected from the river in the Wellington area.

Responses and recommendations

The Drakenstein Municipality intends reducing its dependence on external water sources by, for example, upgrading the Antoniesvlei scheme at Wellington. The construction of a proper water treatment plant will improve the quality of water in the Paarl Mountain supply area.

The Drakenstein Municipality is aiming for a 20% reduction in water demand on 1999/2000 consumption by 2005. This is largely being achieved by repairing leaks, installing pressure control valves and flow controllers, retrofitting with water-efficient toilets, and raising public awareness about the need for water conservation. Water losses have already decreased by 60% during the past few years, and in 2003/2004 represented just under 13% of the total supply.

Pollution-awareness initiatives already taking place in the Drakenstein Municipal area include Water Week exhibitions and river clean-up campaigns undertaken by schools and NGOs. However, farmworkers need to be made aware of the health risks associated with pesticide contamination of farm dams and other unprotected water sources. It is also
recommended that the Drakenstein Municipality undertake a pesticide contamination survey and establish a suitable monitoring programme.

- Adequate sanitation should be provided for people living in informal settlements as a matter of urgency, to reduce faecal contamination of the Berg River system. Bacteriological data should be collected fortnightly at some of the sampling sites to improve data analysis and identify problem areas, and additional sampling sites should be established where stormwater drains are known to discharge highly polluted water into the Berg River.

- It is recommended that the management actions outlined in the State of Rivers report for the Berg River system be implemented. These include, among others, collecting water chemistry data fortnightly, rather than monthly, to highlight trends and specific impacts, and using the South African Scoring Sites (SASS5) method of collecting data on aquatic invertebrates at long-term sampling sites at least once every autumn, spring and summer.

**Biodiversity and Protected Areas**

The Drakenstein Municipal area falls within the Cape Floristic Kingdom, recently declared a World Heritage Site in recognition of its rich biodiversity. Confined to the south-western tip of the African continent, it is the smallest of the world’s six floral kingdoms, but has the highest concentration of plant species – approximately 8 000 in a 90 000 km² area. Of these species, about 70% are endemic, which means they are found nowhere else on Earth. Many of them are threatened, however, so the region is considered a globally important biodiversity ‘hotspot’, in dire need of protection.

ABOVE LEFT: The Drakenstein Municipal area falls within the Cape Floristic Kingdom (displayed in gold and numbered 8) in the Western Cape. ABOVE RIGHT: This graph compares the number of endemic plant species per province. The Western Cape indisputably has the highest concentration of endemic plant species. A significant amount of these plant species are critically threatened and in need of protection.

Protecting biodiversity is not only important from a conservation point of view though. Economic growth and development is promoted by biodiversity, because many species of plants and animals provide a support base for agriculture, fishing, tourism and traditional medicine. Maintaining a healthy biodiversity is also essential in safeguarding ecosystem services, such as water provision, erosion control, crop pollination, and carbon storage to offset global warming.

Unfortunately, population growth and rapid development typically result in changes in landuse, overutilisation of natural resources, pollution and the spread of invasive alien species, all of which contribute to the loss of biodiversity. Indeed, the Drakenstein Spatial Development Framework highlighted low-density, upmarket housing and agricultural development on areas of conservation value as two pressures causing loss of biodiversity within the Drakenstein Municipal Area.

**The current state**

- In 2004, the South African National Biodiversity Institute completed the country's first national assessment of biodiversity. This revealed that the Drakenstein Municipal area includes a particularly high number of threatened ecosystems. Six of the 21 critically endangered vegetation types countrywide occur here, as well as three that are endangered!

- Biodiversity priority areas – essentially all remaining natural habitat in the Drakenstein Municipal area with ‘critically endangered’ or ‘endangered’ status, together with wetlands
Overview of the study area

and other special habitats – have been identified and mapped. The total priority area amounts to 26 022 hectares.

- Protected areas within the Drakenstein Municipal area are making a significant contribution to biodiversity conservation. Of the 26 022 hectares of biodiversity priority, 15 747 hectares is formally protected within four provincial nature reserves, three mountain catchment areas and one local authority nature reserve.

- The Paarl Mountain Nature Reserve became a local authority nature reserve when it was declared a national monument in 1963. It is particularly special because of the variety of plant communities found in a comparatively small area. It has great educational value as it effectively demonstrates how changing habitat conditions influence the distribution of different plant types.

Paarl Mountain Nature Reserve

- The four provincial nature reserves - Limietberg-Hawaqua, Limietberg-Groenberg, Waterval, the Geometric Tortoise Nature Reserve and Waterval-Voelvlei - and three mountain catchment areas - Hottentots-Holland, Hawequa and Winterhoek - are effective at conserving mountain fynbos communities, which play a vital role in water supply. They act as a giant sponge, soaking up water from heavy winter rainfall and slowly releasing it into streams that feed the Breede and Berg rivers, the lifeblood of the south-western Cape’s urban and agricultural areas.

- Although mountain fynbos is well-conserved, it is the vegetation of the lowlands that is most in need of protection. For example, renosterveld grows on fertile soils in moist low-lying regions that are well suited to agriculture, so large areas have been converted to wheatfields, vineyards and grazing pastures. Today, renosterveld has been reduced to less than 3 % of its original extent, and is now found only in isolated fragments. Less than 1 % is formally protected, with the rest falling under private ownership. The largest remaining fragment of renosterveld within the Drakenstein Municipal area is found in the Elandsberg Private Nature Reserve.

LEFT: The single biggest pressure on biodiversity in South Africa and in the Drakenstein Municipal area is loss of natural habitat.

- Invasive alien species are a threat to biodiversity, because they displace indigenous species through competition, and alter vital ecosystem processes such as pollination and seed dispersal. Dense stands of invasive vegetation also use large quantities of water, and increase the intensity of fire. The total area invaded within the Drakenstein Municipal area is unknown, but the State of Rivers report for the Berg River system gives an indication of levels of infestation in sections of the catchment area.

Responses and recommendations

- During 2004, an environmental management policy - setting out goals and objectives – and a Management Strategy - setting out specific actions with timeframes, deliverables and indicators - was compiled for the Paarl Mountain Nature Reserve. It is recommended that the education component of the management policy is implemented in the near future.

- Initiatives are underway to clear alien vegetation from rivers and streams within the Drakenstein Municipal Area, and an alien species control plan has been prepared for the Paarl Mountain Nature Reserve. Future action should include mapping alien vegetation coverage and density, so that the information can be used to prioritise clearing efforts.
• It is recommended that GIS spatial information on biodiversity priority areas is incorporated into landuse decision-making, and a database is developed to record decisions affecting these areas.

WASTE SERVICES

Domestic waste is increasing in volume due to population growth, urbanisation, the highly consumptive lifestyles of affluent people, and low levels of recycling. This places pressure on existing landfill sites, increasing the need for more land to be set aside for waste disposal purposes.

All landfill sites must meet certain standards in order to qualify for an operating permit, because poorly managed sites can affect environmental and human health by polluting air, land and freshwater systems. Leachate from landfills may contaminate soils and groundwater with a variety of pollutants, while gas emissions may endanger communities living nearby. However, the cost of meeting the stricter standards has necessitated imposing higher charges for waste disposal at landfill sites. Unfortunately, this probably leads to more cases of illegal dumping, which pollutes the environment, impacts biodiversity and degrades open spaces.

Inadequate refuse removal services also result in illegal dumping, as well as widespread littering, which is not only an eyesore but a safety concern, since broken bottles and rusty cans can cause injury if inadvertently stepped upon.

The current state

• The Drakenstein Municipality makes use of the recently upgraded Wellington landfill site, which had an initial airspace of 1 400 000 m³. Based on the current landfilling rate of approximately 7 000 m³ per month, the site has a remaining lifespan of about 16.6 years, or 200 months. Some 60 000 tons of waste are received at the landfill per year.

• Approximately 95% of households in the Drakenstein Municipal area have a refuse removal service. Rubbish bags are delivered to all houses, including those in informal settlements. Hermon does not have a house-to-house refuse removal service, but makes use of a central refuse collection point system.

• There are many incidences of illegal dumping and littering, like these pictured below.

• The waste-transfer stations and cleansing depots in all five towns need upgrading.

• The Drakenstein Municipality provides waste services to 10 farms on special request. However, this is not cost-effective, as the farms are far off the refuse collection route. Generally, farmers are responsible for dealing with their own waste, and there are no statistics available on the burning or burying of waste on farms.

• Some industries pay for waste disposal services offered by the Drakenstein Municipality, which provides them with skips or bins for collecting waste. Others rely on private contractors to dispose of their waste.

• There is a dumpsite for builders’ rubble in the Donkervliet industrial area, although all loads bigger than 1 ton or a trailer-full have to make use of the Wellington landfill site. Illegal dumping of builders’ rubble is particularly problematic, given that the Drakenstein Municipality only has one operational digger-loader for the entire municipal area. However, this problem is addressed by hiring of appropriate equipment if and when needed.
• The total volume of waste collected from street-sweeping, street rubbish bins and illegal dumping over a year amounts to 22 000 m3.

**The weighbridge at Wellington landfill site.**

• The Wellington landfill site is not permitted to receive hazardous waste, so most of this – including unknown quantities of medical waste - is sent to Vissershoek landfill site, operated by the City of Cape Town.

**Two informal waste collectors**

• The only recycling initiatives are privately run, by various schools and organisations. There are also a number of informal waste collectors and sorters who collect and sell material to recycling companies, but no records of the volumes of waste being recycled are available.

• The solid waste landfill site at Wateruintjiesvlei was closed in mid 1998, but Paarl will be responsible for the site for 30 years. Monitoring for methane gas and groundwater quality takes place on a monthly, quarterly and annual basis.

**Responses and recommendations**

• A Draft Integrated Waste Development Plan for the Drakenstein Municipal area has been completed.

• It is recommended that capacity be increased in future, to reach the target of door-to-door refuse removal service for all, excluding farms.

• Recycling initiatives (as part of the Poverty Alleviation Programme), as well as waste reduction and minimisation projects, should be promoted.

• The process of upgrading waste transfer stations and cleansing depots should be continued.

• Compulsory reporting of hazardous waste generation should be initiated.

• The number of incidents of illegal dumping, and the volumes of waste concerned, should be properly recorded.

• The municipality has employed law enforcement officers to assist in monitoring of illegal dumping and littering.

**WATER SERVICES**

Access to water supply and sanitation services provide communities with the opportunity to improve their quality of life. However, poor service provision can endanger human health, since inadequately treated drinking water, and sewage that contaminates water sources, may cause various illnesses and spread life-threatening diseases.

The natural environment is also affected if infrastructure is insufficient or poorly maintained, resulting in pollution due to high nutrient and salinity levels, heavy metals and toxic chemicals, litter and organic matter, and pathogens such as viruses and bacteria. At the same time, the quantity and quality of water supply is influenced by natural events like drought and floods, and exacerbated by human-mediated impacts such as deforestation, encroachment of alien vegetation, landuse changes and river canalisation.

Addressing the historical imbalance in service delivery to poorer communities is a priority for the Drakenstein Municipality. However, the infrastructure associated with the provision of water services is expensive to install, and requires ongoing costly maintenance.

**The current state**
Almost 98% of the 44,410 households surveyed in the 2001 census had access to piped water. The remaining 946 households were using unreliable or unhygienic water sources, but the number is believed to have declined since then due to improved service delivery by the Drakenstein Municipality.

Some 90-95% of households are serviced by running water and flushing toilets. Fairyland informal settlement has communal ablution facilities, which are only partially operational due to vandalism and incorrect usage – blockages frequently occur as people use newspaper instead of toilet paper.

Communal Ablution Facilities
- Although no sewage is deliberately discharged into the Berg River and its tributaries, some accidental contamination of the river system occasionally occurs due to blockages and overflows in the sewers. During rainy periods, large volumes of stormwater entering the sewer system exceed the capacity of the pipe network and waste water treatment works.
- The high-lying areas of Wellington experience poor water pressure, which sometimes results in service interruptions during periods of peak water demand, as well as inadequate flow for fire-fighting purposes. In addition, high static pressure causes frequent pipe bursts and leaks, leading to service interruptions and water losses.
- There have been no reported cases of cholera in the Drakenstein Municipal area to date. Regular tests are carried out in the rivers, water supply and sewage systems to ensure early detection, and the Municipality strives to raise public awareness about the disease.
- All the existing public toilets have full-time staff, and most of the facilities are open seven days a week. However, there is a demand for public toilets in the Northern Paarl business node, where farmworkers do their shopping.
- There are five bulk sewage facilities for the Drakenstein Municipal area – at Pearl Valley, Paarl, Wellington, Gouda and Saron – and special facilities are available for winery and industrial effluent. Paarl’s sewage facility is the largest, with a capacity of 35 Mega-litres per day. It is currently being upgraded to provide sufficient capacity until 2010, and to reduce phosphate content to 1 Mg/l to fulfil the conditions of the new permit it must obtain to continue operating. Once this upgrade is complete, work will begin on the Wellington facility, which is receiving more sewage than its intended capacity. This is placing enormous pressure on the facility, particularly during the summer months.

Responses and recommendations
- The Drakenstein Municipality has drawn up a Water Services Development Plan, which covers the urban areas of Paarl, Wellington, Saron and Gouda. This will be revised regularly to facilitate planning for the upgrading of bulk water infrastructure. It will also be amended to include other areas, especially those to the south of Paarl such as Klapmuts, Simondium and Wemmershoek, and rural areas taken over from the Cape Winelands District.
- A new Diemersfontein reservoir will be constructed and several pipelines upgraded in order to improve water pressure in parts of Wellington.
- The Paarl Sewage Master Plan indicates a need to upgrade many main sewer pipelines towards the Paarl waste water treatment works.
The Drakenstein Municipality is in the process of supplying adequate and efficient sanitation to all, with service delivery to informal areas considered top priority.

The completion of the Drakenstein Water and Sewer Master Plans for Paarl and Wellington have been updated.

A new water purification works on Paarl Mountain planned to improve the water quality.

A new Waste Water Treatment Works (Sewage) study for the Paarl South Rural Area is being undertaken.

ENVIRONMENTAL GOVERNANCE


Environmental Governance encompasses all activities of municipalities, rather than only ‘green issues’, and must integrate the three pillars of sustainable development - environment, economic and social. Larger cities were the first to adopt Environmental Governance principles; smaller local authorities, including the Drakenstein Municipality, have only recently started applying the concept.

However, implementation is unlikely to progress unless there is more collaboration between different spheres of government, clarity on areas of responsibility, and political accountability. The public’s lack of environmental awareness and will to be regulated are added stumbling blocks.

The current state

An estimated 3%, or R17 million, of the Drakenstein Municipality’s budget is spent on environmental governance. Of this, R6.3 million funds operational costs and the remaining R10.7 million supports capital work.

Operational costs include those associated with aspects as varied as tourism, amalgamation of informal trading areas, neighbourhood gardens, sanitation infrastructure to farmworkers, alien plant control, flood monitoring, street sweeping and water treatment.

Capital costs include those associated with, among others, rural road lighting, public toilets, solid waste sites, traffic calming, sidewalk construction, sewage system upgrades, as well as the compilation of the State of Environment report.

Responses and recommendations

The Drakenstein Municipality is considering establishing an environmental management section. In the interim, there are a number of staff members with a direct influence on environmental management, such as the nature conservation officer responsible for the Paarl Mountain Nature Reserve.

A Spatial Development Framework is in the process of being drawn up for the Drakenstein Municipal Area, together with a Strategic Environmental Assessment.

It is recommended that the Drakenstein Municipality adopt Local Agenda 21.

Although the Drakenstein Municipality does not have an environmental policy, the State of Environment Report is seen as the first step in the development of such a policy.
Annexure 25: Draft Paarl Farms Land Use Management Policy

This policy proposes future use for the Paarl “town farms” which have found themselves under severe pressure for development over the past few decades. The study included an investigation into the agricultural potential and heritage and landscape value of these farms.

The draft policy has ruled out the development of low density gentleman's estate type development and other forms of low density development as not appropriate because of its concern for urban sprawl, the visual impact of such developments and the setting of a precedent for future development. Very limited residential development will, however, be considered provided that the impact on high potential agricultural land is eliminated and that there are limited or no visual impact or impact on heritage resources. Commercial development that could be considered includes restaurants and wine-tasting facilities provided that these remain secondary to the agricultural activities on the property and is seen to be an additional income.
Annexure 26: Urban and Rural Vacant Land Studies

The Drakenstein Municipality has recently commissioned two separate studies to investigate the availability of suitable land for development within its urban centres as well as rural areas. The four urban areas that formed part of the urban land audit are Paarl/Mbekweni, Wellington, Gouda and Saron. These studies identified and evaluated vacant land on the basis of a set of criteria developed by the municipality.
Annexure 27: The Drakenstein Housing Plan 2004

The Drakenstein Housing Plan investigates the current and projected housing needs within the municipality and proposes the provision of between 500 and 1 500 residential units per year. The municipality is divided into eight areas and three main categories of housing are proposed for the municipal area for the 2005/6 financial year:

- subsidy housing;
- social housing for households earning more than R3 500 per month; and
- emergency housing

The Housing Plan also highlights the demand for rural housing (20% of the total need) and proposes the provision of approximately 4 000 residential units within the existing urban areas for the 2005/6 financial year and an additional 600+ units in the rural areas during the same period.