ANYSBERG NATURE RESERVE & WORLD HERITAGE SITE

Western Cape, South Africa

Protected Area Management Plan 2018 – 2028

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CapeNature

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Prepared by Mr Marius Brand, Dr AnneLise Schutte-Vlok & Mr Johan Huisamen

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[Cover page photo: **One of the numerous scenic vistas of Anysberg Nature Reserve and World Heritage Site (ANR&WHS) – here showing the mountains of the Grand Canyon sector (Photo: Hans van der Veen).** Insert photo: ***Gibbaeum pubescens*** **(haaibekkies), one of the gems found on ANR&WHS (Photo: Jan & AnneLise Vlok).]**

The Anysberg Nature Reserve and World Heritage Site (ANR&WHS) comprises the following:

Anysberg was first declared a Demarcated Forest in terms of Section 5 of the Forest Act, 1913 (Act 16 of 1913) as amended in Government Gazette 2390 of 20 November 1936 as per Notice 1724 of the same date.

Anysberg was again set aside as a Nature Reserve in terms of Section 7 of the Forest Act, 1968 (Act 72 of 1968) in Government Gazette 9231 of 25 May 1984 as per Notice 1050 of the same date.

Anysberg Provincial Nature Reserve has been established as a Provincial Nature Reserve in terms of Section 6(1) of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974), in the Cape of Good Hope Official Gazette 4656 of 17 August 1990 as per Notice 51/1990 of 6 August 1990.

Anysberg Provincial Nature Reserve, amendment of the boundaries of the Provincial Nature Reserve in terms of Section 6(1)(b) of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974) on 7 October 1996 in the Provincial Gazette by Proclamation No. 57/1996.

In terms of section 6(1)(b) of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974), an alteration of boundaries as well as rectification of Proclamation No. 51/1990 dated 17 August 1990 of the existing Anysberg Nature Reserve took place in 1996 and published in Provincial Gazette 5095 of 29 November 1996 as per Notice 57/1996 of 07 October 1996.

The boundaries of the Anysberg Provincial Nature Reserve was again extended in terms of Section 6(1)(b) of the Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974) and published in Provincial Gazette 6477 of 9 November 2007 as per Notice 16/2007 of 20 October 2007.

An alteration of boundaries as well as rectification of Proclamation No. 16/2007 dated 09 November 2007 of the existing Anysberg Nature Reserve took place in 2008 and published in Provincial Gazette 6557 of 29 August 2008 as per Notice 13/2008 of 25 August 2008.

Boundaries of Anysberg Provincial Nature Reserve is being extended to include the properties of Grand Canyon and Annex Allemorgensfontein purchased by World Wide Fund for Nature – South Africa (WWF-SA) in 2012 with funding from the Leslie Hill Succulent Karoo Trust (LHSKT), and is in the process of being declared as a Provincial Nature Reserve in terms of Section 23 (1) of the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003).

Anysberg Nature Reserve has been inscribed as an extension of the Cape Floral Region Protected Areas World Heritage Site (CFRPA WHS) by the World Heritage Committee of

UNESCO (United Nations Educational, Scientific and Cultural Organisation) on 3 July 2015.

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- Dr Martine Jordaan (Scientific Technician) and Ms Jeanne Gouws (Scientist: Aquatic) for fish and hydrological information;
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- Mr Liwa Gunguluza (Project Manager: Region East) for assistance with the regional planning section;
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EXECUTIVE SUMMARY

In compliance with the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003) (NEM: PAA), CapeNature is required to develop management plans for each of its Protected Areas. In developing the management plan for the ANR&WHS, CapeNature strives to establish biodiversity conservation as a foundation of a sustainable economy providing ecosystem services, access and opportunities for all. The object of a management plan is to ensure the protection, conservation and management of the protected area concerned in a manner which is consistent with the objectives of the NEM: PAA and for the purpose for which it was declared. The approach to, and format of all CapeNature management plans is directed by the *Guidelines for the Development of a Management Plan for a Protected Area in terms of the National Environmental Management: Protected Areas Act* (Cowan & Mpongoma 2010).

This management plan comprises seven sections.

Section 1 outlines the background, structure and authorisation processes of the management plan.

The management plan focuses on strategic priorities rather than detailing all operational and potential reactive courses of action in the next 10 years. The timeframe referenced in the Strategic Implementation Framework (SIF) follows financial years (1 April to 31 March), with Year 1 commencing from signing of the management plan by the Provincial Minister: Environmental Affairs and Development Planning. While planning for some emergencies is part of the management plan, it remains possible that unforeseen circumstances could disrupt the prioritisation established in this management plan. These should be addressed in the annual review and update of the management plan. The scope of the management plan for protected areas is constrained by a reserve's actual or potential performance capability (such as available personnel, funding, and any other external factors) to ensure that the plan is achievable and sustainable.

The management plan is drafted by the Reserve Management Committee, and then goes through an internal scientific and technical review. It is then sent for an independent external review before being recommended for stakeholder participation. The management plan is then reviewed by the CapeNature Executive and recommended by the Chief Executive Officer (CEO) to the Conservation Committee of the Western Cape Nature Conservation Board (WCNCB). Once approved by the Conservation Committee, it is referred to the WCNCB for approval before being submitted by the Chairman of the WCNCB to the Department of Environmental Affairs and Development Planning for ministerial approval. The Western Cape Minister of Local Government, Environmental Affairs and Development Planning then sends the management plan out for public participation and only thereafter and based on the inputs received, can the plan be gazetted. The protected area management plan is reviewed annually to track progress on the SIF discussed in Section 6 and the document will be updated and reviewed every 10 years.

Section 2 outlines the strategic management framework, which is aimed at providing the basis for the protection, development and operation of the protected area over a 10-year period. It consists of the vision, purpose, values and objectives of the ANR&WHS and summarises its opportunities, challenges, weaknesses and threats. The ANR&WHS forms part of the protected area network in the Klein Karoo (Little Karoo) and its vision is to conserve a system of sustainable living landscapes in the Klein Karoo, that represent the region's biodiversity and ecosystems, through the integrated management of formally protected areas, for the benefit of all.

The purpose is the foundation on which all future actions are based and is in line with the overall management philosophy of the organisation. For ANR&WHS the purpose is to manage and conserve the unique and sensitive Succulent Karoo, Fynbos and Maputoland-Tongoland-Albany Subtropical Thicket species, ecosystems and ecological processes of the area.

Values are characteristics that deem the reserve complex unique in terms of its ecological, cultural and social aspects. The values for the ANR&WHS are characterised according to natural, ecosystem services, social, cultural and historic and eco-tourism values. Natural values include: the unique biodiversity and high endemism of the area; the presence of riverine rabbit and Cape mountain zebra populations; the numerous plant species that are of conservation concern (including at least 20 undescribed species); the large area (*ca.* 80 000 ha) that is captured under formal conservation and forms part of a larger protected area network; the very localised alien plant infestations that are present in the area and that are being actively managed; the night skies that are free of light pollution; the fact that ANR&WHS falls within an area where three globally recognised biodiversity hotspots converge (Fynbos, Succulent Karoo and Maputoland-Tongoland-Albany Subtropical Thicket); and that it has been inscribed as part of the CFRPA WHS extension. Ecosystem service values include: the important water catchment area, contributing to improved water flow regulation, infiltration, quality and quantity; the provision of other ecosystem services, such as carbon sequestration, pollination, *etc.*; it forms part of the core area of the Gouritz Cluster Biosphere Reserve (GCBR); its contribution to improved soil retention and condition as a result of resting and restoration of veld; its provision of improved grazing for indigenous game, and the scenic landscapes and solitude for tourism. Social values include: strong partnerships with governmental and non-governmental stakeholders; opportunities for environmental awareness raising and local economic development; its enthusiastic and passionate staff and strong leadership; the research opportunities for students and scientists; the potential for staff development; the many knowledgeable, concerned and involved neighbours and stakeholders; and its aesthetic and wilderness attributes. In terms of its cultural and historic value, the exceptional richness in archaeological and marine palaeontological sites are of significant importance. The natural and scenic beauty of the area and the peace and tranquillity it offers are valuable drawcards for visitors to the area; and the existing infrastructure of roads and facilities, as well as a wide range of recreational activities provide opportunities for them to enjoy the area.

Objectives were derived from the vision and purpose and represent Key Performance Areas (KPA) in which achievement must be obtained in order to support the management intentions. The prioritised objectives are: 1) to conserve the natural ecosystems (life support systems); 2) to manage the conservation estate effectively; 3) to secure the conservation estate; 4) to expand the conservation estate; 5) to promote biodiversity conservation awareness; 6) to promote the sustainable utilization of natural resources; and 7) to effectively conserve the cultural heritage attributes.

Once these objectives were identified, a SWOT analyses was completed. A SWOT analysis is a strategic planning method used to evaluate the relevant strengths, weaknesses, opportunities, and threats. Strengths of the ANR&WHS include: the available and effective management and scientific expertise; the largely intact natural environment; the high diversity in flora and fauna present; the fact that it falls within three hotspots of global biodiversity; the scenic environment and peace and tranquility of the area; the variety of recreational activities that are available; the large geographical area included in the WHS; the fact that landscape corridor planning is informed and that overall planning is integrated and co-ordinated; the dedicated staff; presence of several rare and threatened plant species and the research opportunities that are available; the numerous sites of cultural and spiritual significance; the governmental and non-governmental partners that are involved; the knowledgable and involved neighbours and stakeholders; the fact that if forms part of the extended CFRPA WHS and the core area of the GCBR. Weaknesses identified include: lack of capacity (i.t.o. staff numbers); the limited budget; difficulty to source contractors due to nature of roads and accessibility; poor involvement of community conservation as a result of budget and transport constraints; long fence boundaries which are difficult to patrol and maintain; and infrastructure damage due to flood damage. Opportunities identified include: the existing and potential partnerships; potential for expansion through stewardship or purchase; partnering with the GCBR; tourism potential; development and training; environmental education and research; volunteer programmes (*e.g.* Custodians of Rare and Endangered Wildflowers (CREW)); and marketing and communication opportunities. Threats identified include: floods; invasive alien fauna and flora; biodiversity crime; fauna mortality due to fencing (tortoise and smaller game) and limiting free movement of indigenous animals; the impact of ostriches on the veld and difficulty to get game capture or cull initiated; fracking in the Karoo; illegal access due to public road through the reserve; renewable energy developments on adjacent properties; historical soil erosion and river and catchment degradation. These strengths, weaknesses, opportunities and threats are then addressed in the reserve objectives, and activities identified to deal with them in the SIF.

Section 3 provides a description of the ANR&WHS and its ecological and operational context. ANR&WHS is located in the western Klein Karoo, between the towns of Laingsburg, Touwsrivier, Montagu and Ladismith. It is a large protected area of 79 629 ha. For management purposes it has been divided into six sectors: Anysberg Mountain, Vrede Vallei, Kleinspreeufontein, Touwsfontein, Allemorgensfontein and Grand Canyon. The office complex is situated in the Vrede Vallei where most of the staff members are housed and which is also the location of the majority of the tourism infrastructure. The remarkable history of the establishment of ANR&WHS from the initial 5 197 ha state

forest reserve located at the top of Anysberg Mountain to the current 79 629.4 ha through land purchase and donations is discussed.

The ecological context of the ANR&WHS covers a number of aspects: the climate, topology, geology and soils, aquatic systems, vegetation and habitat descriptions (according to the South African Vegetation Map and the fine-scale vegetation map for the Klein Karoo), as well as the fire regimes important for maintaining the Fynbos biodiversity. The invasive alien plant species occurring within the WHS are listed and their distribution is illustrated.

From a vegetation perspective, the ANR&WHS captures vegetation types from three globally important biomes: Fynbos, Maputoland-Tongoland-Albany Subtropical Thicket and Succulent Karoo. According to the fine-scale vegetation map of the Klein Karoo, 40 vegetation units occur in the ANR&WHS, 37 of which are terrestrial and three aquatic. A description of each of the units is provided, listing representative species and highlighting those that are of conservation concern. At least 40 priority plant species and no less than 20 undescribed species have been recorded in the ANR&WHS. A total of 30 invasive alien plant species have been documented and mapped in the ANR&WHS. An invasive alien plant clearing programme is being implemented to control these species. With the acquisition of additional land to Anysberg Nature Reserve that had historically been extensively farmed, CapeNature inherited large areas that had been overgrazed. Most of the highly palatable species have been grazed to small stumps and there is clear evidence of sheet erosion and donga formation. A project is being planned to address some of the erosion problems. In terms of fire management, very few fires have been recorded for ANR&WHS since the 1980s. A natural fire zone management approach is being implemented, where fires that are caused through natural ignitions (*e.g.* lightning strikes, rock falls, *etc.*) are left to burn until they burn out or are extinguished as a result of rainfall. Because of the arid climate of the Klein Karoo the fire return interval is long, probably around 25-40 years.

A summary of the available information on mammal, bird, amphibian and reptile, fish and invertebrate species is provided, as well as lists of the species that are of conservation concern. Riverine rabbit (*Bunolagus monticularis*; listed as Critically Endangered), Cape mountain zebra (*Equus zebra zebra*; Least Concern - conservation dependant), Cape leopard (*Panthera pardus pardus*; Vulnerable), and brown hyaena (*Parahyaena brunnea*), grey rhebok (*Pelea capreolus*) and the African clawless otter (*Aonyx capensis*) all listed as Near Threatened are noteworthy mammal species on the ANR&WHS. Of a total of 183 bird species recorded on ANR&WHS, 10 are of conservation concern. The domesticated ostrich (*Struthio camelus*) is the only alien bird species occurring within the ANR&WHS and its numbers need to be monitored and controlled, because it is known to have a negative impact on the veld. No amphibian or reptile species of conservation concern are known from ANR&WHS. *Pseudobarbus asper* (Endangered) and *Sandelia capensis* (Data Deficient) are endemic fish species of conservation concern recorded on ANR&WHS, and *Tilapia sparrmanii* and the common carp (*Cyprinus carpio*) are non-native fish species that have been found in the area. Game species occurring on ANR&WHS include eland (*Taurotragus oryx*), gemsbok (*Oryx*

gazelle), kudu (*Tragelaphus strepsiceros*), *red hartebeest* (*Alcelaphus buselaphus*), springbok (*Antidorcas marsupialis*), grey rhebok (*Pelea capreolus*), klipspringer (*Oreotragus oreotragus*), common duiker (*Sylvicapra grimmia*), steenbok (*Raphicerus campestris*), the domesticated ostrich (*Struthio camelus*), and Cape mountain zebra (*Equus zebra zebra*) that have been reintroduced. The impact of these game species on the veld need to be carefully managed, as the Vrede Vallei, Kleinspreeufontein, Touwsfontein, Allemorgensfontein and Grand Canyon sectors have large areas that are in the process of recovery from historic overgrazing. It is critical that these areas must be protected to avoid any over-utilisation by the current game species.

There are numerous rock art, stone age tool, grave and fossil sites throughout the ANR&WHS. The rock art is in danger of disappearing due to the degree of natural weathering, water seepage, fire and the impacts of human visitors. Often the paintings and engravings are damaged due to disrespect and lack of knowledge at sites. Currently, only the rock art site at Tapfontein is open to visitors.

In terms of infrastructure, the ANR&WHS is well-serviced by a large network of roads and tracks throughout the nature reserve, as well as three gravel public roads. Most of the facilities on the ANR&WHS are clustered at Vrede and include an office building, six staff houses, five tourism cottages, two ablution facilities, a field ranger's office, laundry, store/workshop, a fuel store, the stables and camping sites. The manager's house is 10 km east of the Vrede office, known as Goedehoop. Although the ANR&WHS has large game on it, the whole reserve is not adequately fenced to keep all animals in the reserve. Sections of the existing fencing is old and deteriorating and requires replacement in certain areas. This has resulted in game including Cape mountain zebra and eland escaping the reserve and moving onto private land. Boundary fence repair and maintenance is an important management action that is being implemented. All waste from the ANR&WHS is removed from the reserve and disposed of at the municipal refuse site in Montagu. Water for all the facilities around Vrede comes from a pipeline out of Land se Kloof from the Anysberg Mountain, and water for Goedehoop from the kloof behind the manager's house. At Grand Canyon water is supplied from boreholes to the five cottages, the foreman's house and the main house. Each house also has a water tank to collect rainwater.

Section 4 sets out the regional and local planning context of the protected area. ANR&WHS falls within three Local Municipalities (Laingsburg, Langeberg and Kannaland) and three District Municipalities (Central Karoo, Cape Winelands and Eden).

According to the Spatial Development Framework (SDF) for Laingsburg Municipality, ANR&WHS, Klein Swartberg (Towerkop) and Gamkaspoort Nature Reserves, and the declared Mountain Catchment Areas form part of the Core 1(a) Area (formally protected conservation areas), and the extension of these existing formally protected areas into a continuous biodiversity corridor through stewardship agreements should be promoted. All rivers and their tributaries and the Floriskraal and Gamkaspoort Dams fall within the Core 1(b) Area (Critical Biodiversity Area (CBA)). These should be protected by an ecological corridor. Core 2 Areas include ecological support areas, such as the Grand

Canyon property, which has since been purchased for conservation. Hence, a formal continuous biodiversity corridor is now established.

ANR&WHS is situated within the far north eastern corner of the Langeberg Municipality's planning domain. The Langeberg Municipality SDF indicates ANR&WHS as a Core 1(a) category. Core 2 criteria are also applicable to ANR&WHS as the protected area plays an important role in providing healthy river corridors and catchments. The Langeberg SDF highlights the importance of protecting and completing the conservation linkages of the Langeberg Mountain corridor between ANR&WHS, Rooikrans and Drie Kuilen Private Nature Reserves and Matroosberg Mountain Catchment Area. The formal and informal conservation areas should continue to be extended by promoting private nature reserves through stewardship agreements and permitting resort development within the relevant guidelines as an incentive. This will promote economic growth and employment creation in the tourism sector as well as promote biodiversity conservation.

A small portion of ANR&WHS falls within the Kannaland Municipality and the relevant area is mapped as Core 1(a) and Core 1(b). Most of the properties that have been identified as priorities for stewardship fall within Core 1(b) or Core 2 (*i.e.* Ecological Support Areas, such as river corridors and other ecological corridor areas).

The expansion of protected areas in South Africa is informed by the National Protected Area Expansion Strategy (NPAES) and CapeNature's Protected Area Expansion Strategy and Implementation Plan has been developed in support of the NPAES.

The planned expansion of the ANR&WHS is in line with both the national strategy and the CapeNature expansion strategy. ANR&WHS falls in the core of the GCBR, which aims to support a system of sustainable living landscapes that is representative of the region's biodiversity through the co-existence of all stakeholders. In the past, the expansion of the ANR&WHS has mainly been achieved through land purchase by the WWF-SA. Now, the chief mechanism is through the signing of stewardship agreements with neighbouring private landowners.

Section 5 outlines the Conservation Development Framework (CDF) and the concept development plan for the protected area. Sensitivity mapping of reserve biodiversity, heritage and physical environment are sources of information for spatial planning and decision-making in protected areas. It is intended to inform all planned and ad hoc infrastructure development, *e.g.* location of management and tourism buildings and precincts, roads, trails, firebreaks; inform whole reserve planning and formalisation of use and access as a reserve zonation scheme while also supporting conservation management decisions and prioritisation.

The sensitivity analysis for ANR&WHS included physical, biodiversity and heritage features. It was found that most of the physical characteristics of ANR&WHS (57% of slopes and 80% of the soils) are low to lowest sensitivity and the vulnerability status of the vegetation is largely low (99% of the area scored "lowest sensitivity"), but that the overall sensitivity of the majority (66%) of the area is high to very high. This is due to the

high to highest sensitivity of the perennial and non-perennial rivers and river habitat. The sensitivity analysis has therefore been dominated by the drainage systems of ANR&WHS, leaving only 19% of area scored as “low or lowest sensitivity”.

Protected area zonation provides a standard framework of formal guidelines for conservation, access and use for particular areas. Zonation goes beyond natural resource protection and must also provide for appropriate visitor experience; access and access control; environmental education; and commercial activities.

Some of the key drivers of ANR&WHS’s zonation are: the large size of the protected area; its importance as a water catchment area, the local Succulent Karoo, Fynbos and Subtropical Thicket biodiversity that it protects and the ecological corridors along west-east and north-south gradients that it forms part of; the SA vegetation types represented in ANR&WHS are all Least Threatened, except for Montagu Shale Renosterveld, which is classified as Vulnerable and poorly protected; at a fine-scale vegetation level, only the Buffels River and floodplain unit is Endangered and partially protected; large sections of the veld in ANR&WHS (particularly of the Grand Canyon, Allemorgensfontein and Touwsfontein sectors) are at different stages of natural recovery; resting of the veld has resulted in palatable species, which had previously been subject to continuous grazing, to flower, set seed and recruit following good rainfall events; at least 40 plant species of conservation concern have been recorded on ANR&WHS and no less than 20 confirmed undescribed plant species have been discovered (many of which are highly palatable to stock and game); parts of the Kleinspreeufontein, Vrede Vallei, Grand Canyon and Touwsfontein sectors provide high quality habitat for Cape mountain zebra and riverine rabbit have been recorded in the western extent of Allemorgensfontein. The areas harbouring these species are considered sensitive to disturbance and could qualify as ‘Habitat Protection Zones’, but are included in the low use Primitive Zone, because of the extensive areas covered.

The zonation of ANR&WHS is summarised as follows:
Wilderness Zone: The northern section of Kleinspreeufontein and the eastern section of Grand Canyon have large, remote areas that are essentially inaccessible (except via the limited management tracks) and can provide a true wilderness experience and opportunities for leave-no-trace activities, but a viewshed analysis would need to be done to delimit the exact extent of this zone. Development Management Zone: This zone includes the main office complex, staff village (Vaughanville) and all other management buildings (manager’s house at Goedehoop, existing buildings on Grand Canyon, Allemorgensfontein, Touwsfontein and Kleinspreeufontein). Development Low Intensity Zone: This covers the tourism infrastructure located near the Vrede office complex, including five self-catering cottages (sleeps 20 people in total), five campsites and an ablution facility (for 30 people in total). An additional self-catering cottage is planned for the open space adjacent to Gecko cottage (sleeps six people in total), which fits in with the Development Low Intensity Zonation. Nature Access Zone: The Ladismith-Laingsburg district road that cuts through Grand Canyon and the subordinate public roads to Montagu and Touwsrivier along the valley through Grand Canyon, Vrede Vallei and Allemorgensfontein fall within this zone. A high clearance vehicle is however required to drive on these roads. Primitive Zone: This zone covers all the remaining

natural veld allowing for the protection of extensive special habitats and the intrinsically wild appearance and character of the area. The Tapfontein overnight facility (sleeping eight in total), the main house at Grand Canyon which is currently being upgraded as a tourism facility (that can sleep eight people), the two 4x4 routes (Anysberg Mountain and the Tapfontein circular route), the two-day horse trail, the day trail to Land se Kloof and all other tracks within ANR&WHS are also included in this zone.

In terms of developments, a new self-catering cottage (six sleeper) is planned for the open area adjacent to the existing cluster of four cottages at Vrede. Furthermore, the main house at Grand Canyon is being turned into a tourism unit (sleeping eight people). No other developments are planned for the next 10 years.

Section 6 outlines the SIF of the complex. It guides the implementation of the management plan over 10 years in order to ensure that it achieves its management objectives. The SIF translates the information described in Sections 3, 4 and 5 into management activities and targets, which will be used to inform annual plans of operation as well as the resources required to implement them. The management targets will form the basis for monitoring of performance in implementing the plan and are thus measurable. The SIF contains the following sections: legal status and reserve expansion; regional integrated planning and cooperative governance; ecosystem and biodiversity management; wildlife management; fire management; invasive and non-invasive alien species management; cultural and heritage resources; law enforcement and compliance; infrastructure management; disaster management; socio-economic framework; management effectiveness; finance and administration management; human resources management; occupational health and safety management; risk management; visitor management, and the tourism development framework.

Finally, **Section 7** contains the references and glossary relevant to the text. This section is followed by all the maps referred to in the document.

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ABBREVIATIONS

APO	Annual Plan of Operations
ANR&WHS	Anysberg Nature Reserve and World Heritage Site
BMP-s	Biodiversity Management Plan for Species
BMS	Biodiversity Monitoring System
CBA	Critical Biodiversity Area
CDF	Conservation Development Framework
CEO	Chief Executive Officer
CREW	Custodians of Rare and Endangered Wildflowers
CFR	Cape Floristic Region
CFRPA WHS	Cape Floral Region Protected Areas World Heritage Site
CN	CapeNature
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs

EMP	Environmental Management Plans/ Programme
EPWP	Expanded Public Works Programme
GCBR	Gouritz Cluster Biosphere Reserve
GIS	Geographical Information System
GRAP	Generally Recognised Accounting Practices
GTUP	Game Translocation and Utilisation Policy
HIRA	Hazard Identification and Risk Assessment
ICM	Integrated Catchment Management
IDP	Integrated Development Plan
IUCN	International Union for Conservation of Nature and Natural Resources
LHSKT	Leslie Hill Succulent Karoo Trust
METT-SA	Management Effectiveness Tracking Tool for South Africa
MUCP	Management Unit Clearing Plan
NBAL	Natural Biological Alien
NBSAP	National Biodiversity Strategy and Action Plan
NEM: BA	National Environmental Management: Biodiversity Act
NEM: PAA	National Environmental Management: Protected Areas Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Area Expansion Strategy
OHS	Occcupational Health and Safety
OHSA	Occupational Health and Safety Act
PAAC	Protected Area Advisory Committee
PFMA	Public Finance Management Act
RHP	River Health Programme
SANBI	South Africa National Biodiversity Institute
SCM	Supply chain Management
SDF	Spatial Development Framework
SIF	Strategic Implementation Framework
SMME	Small, medium and macro enterprises
SOB	State of Biodiversity
SOG	Standard Operating Guideline
SOP	Standard Operating Procedures
SWOT	Strengths, weaknesses, opportunities and threats analysis
TPC	Threshold of Potential Concern
U-AMP	User-Asset Management Plan
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WCNCB	Western Cape Nature Conservation Board
WCPAES	Western Cape Protected Area Expansion Strategy
WHS	World Heritage Site
WIL	Work Integrated Learning
WWF-SA	World Wild Fund for Nature – South Africa

1) INTRODUCTION

1.1 Background to CapeNature Protected Area Management Plans

In compliance with the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003) (NEM: PAA), CapeNature is required to develop management plans for each of its protected areas. The object of a management plan is to ensure the protection, conservation and management of the protected area concerned in a manner which is consistent with the objectives of NEM: PAA and for the purpose for which it was declared. The approach to, and format of all CapeNature management plans is directed by the *Guidelines for the Development of a Management Plan for a Protected Area in terms of the National Environmental Management: Protected Area Act* (Cowan & Mpongoma 2010).

Management plans are strategic documents that provide the framework for the development and operation of protected areas. They inform management at all levels, from the Conservation Manager to support staff within CapeNature. The purpose of the management plan is to:

- Provide the primary strategic tool for management of the protected area informing the need for specific programmes and operational procedures;
- Provide for capacity building, future thinking and continuity of management; and
- Enable the management of the protected area in such a way that its values and the purpose for which it has been established are protected.

When drafting management plans, CapeNature applies the adaptive management cycle, as shown in Figure 1.1.

Adaptive management enables CapeNature to:

i) Learn through experience;
ii) Take account of, and respond to, changing factors that affect the protected area;
iii) Develop or refine management processes;
iv) Adopt best practices and new innovations in biodiversity conservation management; and
v) Demonstrate that management is appropriate and effective.

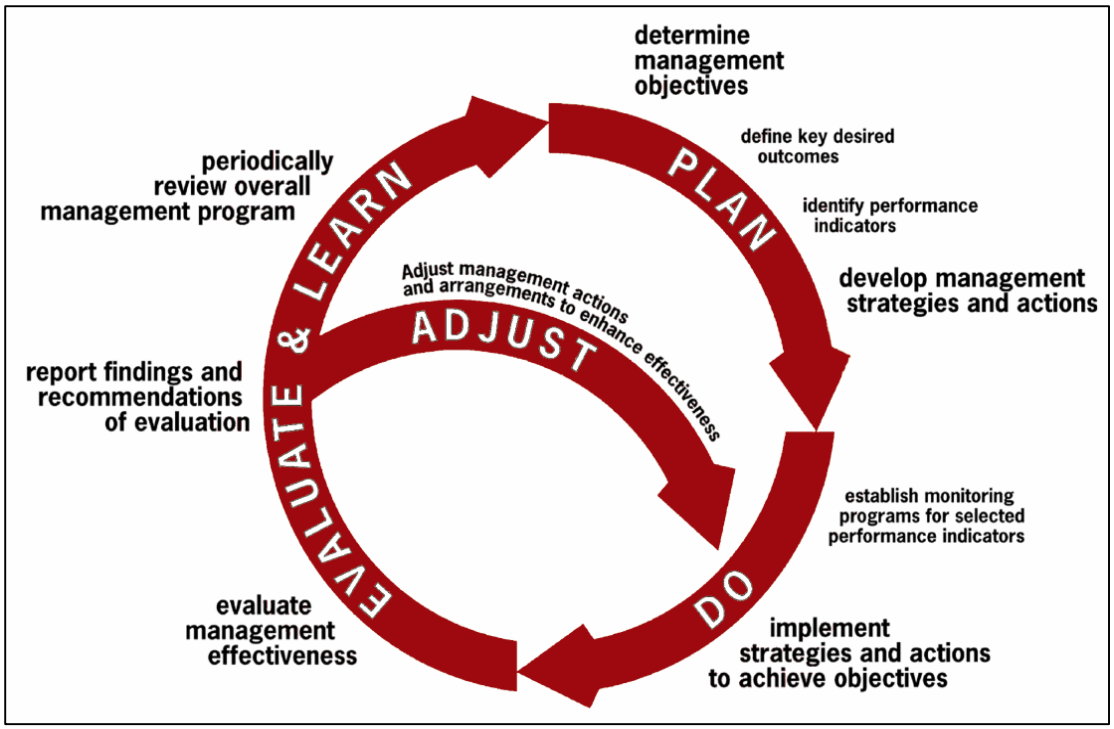

Figure 1.1: Adaptive management cycle (CSIRO 2012).

The management plan indicates where reserve management intends to focus its efforts in the next 10 years (2018-2028). The management plan thus provides the medium-term operational framework for the prioritised allocation of resources and capacity in the management, use and development of the reserve.

The management plan focuses on strategic priorities rather than detailing all operational and potential reactive courses of action in the next 10 years. The timeframe referenced in the Strategic Implementation Framework (SIF) follows financial years (1 April to 31 March), with Year 1 commencing from signing of the management plan by the Provincial Minister: Environmental Affairs and Development Planning. While planning for some emergencies is part of the management plan, it remains possible that unforeseen circumstances could disrupt the prioritisation established in this management plan. These disruptions should be addressed in the annual review and update of the management plan. The scope of the management plan for protected areas is constrained by a reserve's actual or potential performance capability (such as available personnel, funding, and any other external factors) to ensure that the plan is achievable and sustainable.

1.2 Structure of the management plan

All CapeNature management plans are structured as follows (see Figure 1.2):

Section 1:	Outlines the background, structure and authorisation processes of the management plan.
Section 2:	Outlines the strategic management framework, which sets out the vision, purpose, values and objectives for the protected area and summarises its opportunities, challenges, and threats.
Section 3:	Provides a description of the protected area and its ecological and operational context.
Section 4:	Sets out the regional and local planning context of the protected area.
Section 5:	Outlines the conservation development framework and the concept development plan for the protected area.
Section 6:	Outlines the strategic implementation framework of the protected area.
Section 7:	References and Glossary

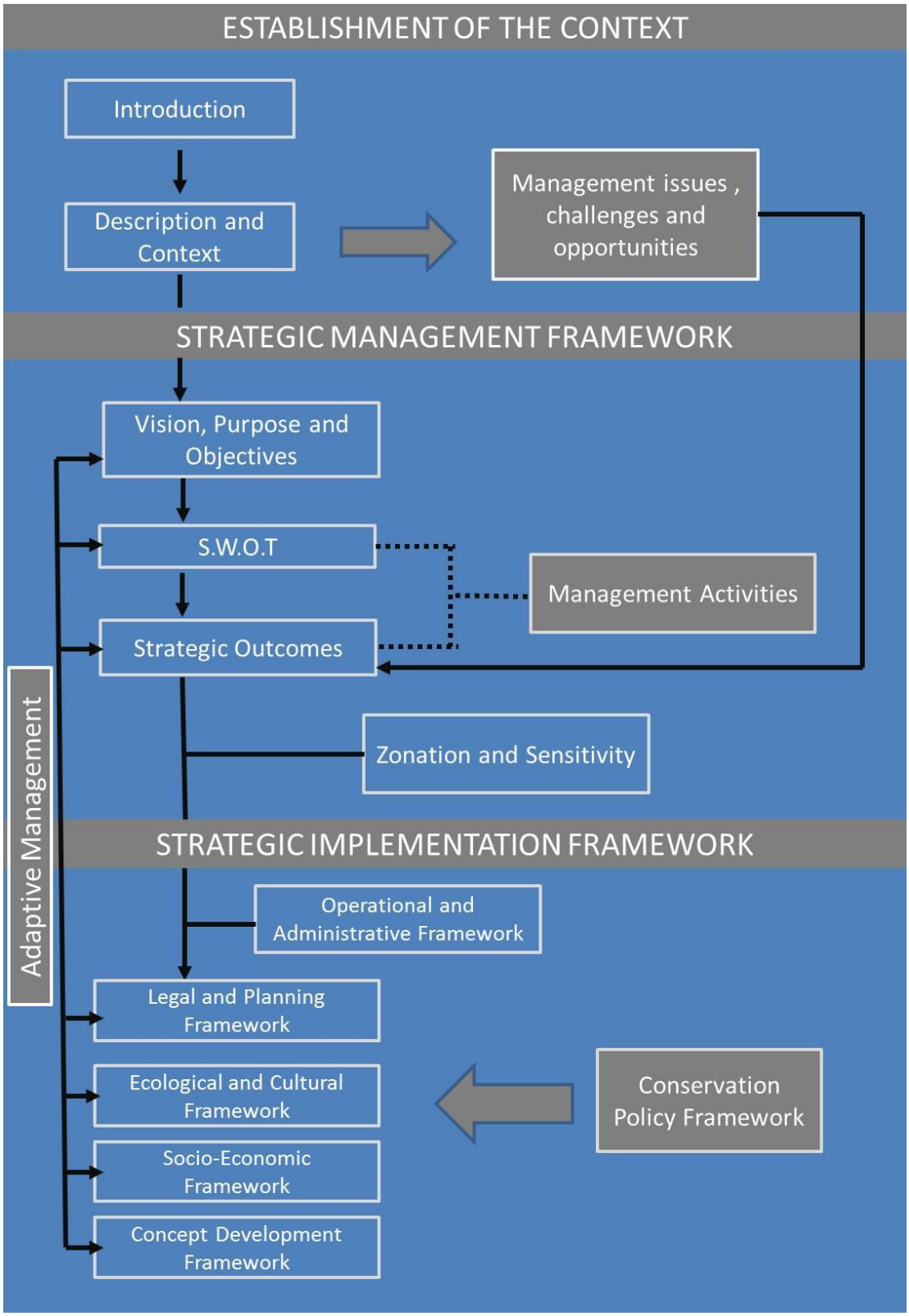

Figure 1.2: Structure of the management plan.

1.3 Approval and revision of the management plan

The management plan is drafted by the Reserve Management Committee. The scientific and technical content of the management plan is then internally reviewed according to Waller (2011). The amended management plan then undergoes an independent external review before being recommended for stakeholder participation where comments are considered and the management plan is once again amended where necessary. The management plan is then reviewed by the CapeNature Executive and recommended by the CEO to the CapeNature Conservation Committee. Once approved by the Conservation Committee, it is referred to the Western Cape Nature Conservation Board (WCNCB) for approval before being submitted by the Chairman of the WCNCB to the Department of Environmental Affairs and Development Planning for ministerial approval. The approval process of the protected area management plan is outlined in Figure 1.3.

The protected area management plan is audited annually to track progress on the SIF discussed in Section 6 and the document will be updated and reviewed every 10 years.

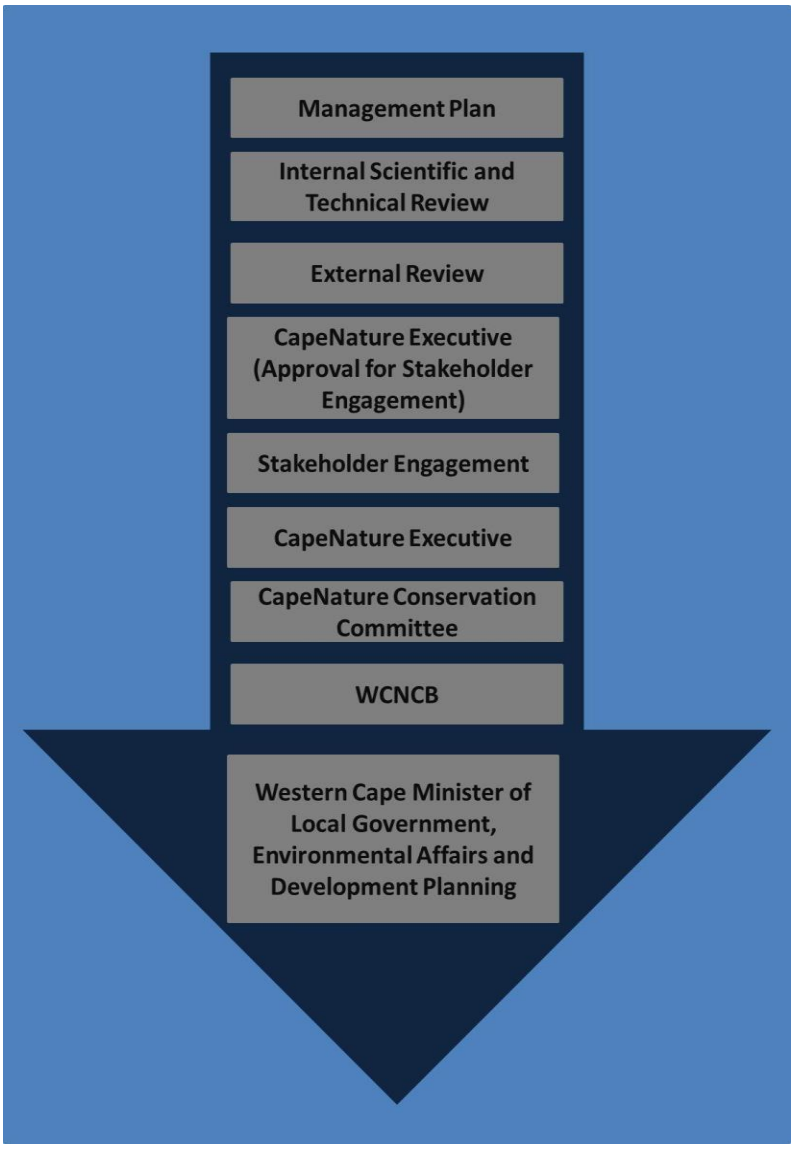

Figure 1.3: Approval and review of the management plan.

2) THE STRATEGIC MANAGEMENT FRAMEWORK OF ANYSBERG NATURE RESERVE AND WORLD HERITAGE SITE

The strategic management framework is aimed at providing the basis for the protection, development and operation of the protected area over a 10-year period. It consists of the vision, purpose, values and objectives of ANR&WHS and summarises its opportunities, challenges, and threats.

A planning session, facilitated by the Regional Ecologist and guided by the Conservation Manager, defined the vision and purpose of the protected area. This umbrella statement indicates the management intent of the ANR&WHS which in turn defines the management objectives. The management objectives were evaluated using the *Procedure for Defining Conservation Management Objectives and Goals* (Coombes & Mentis 1992) and categorised into objectives, action plans and tasks. The management objectives were prioritised through a pairwise comparison process and the results were used to populate the SIF (see Section 6). Actions plans were associated with objectives, and tasks (activities) were identified within each action plan.

2.1. The vision of Anysberg Nature Reserve and World Heritage Site

The vision describes the overall long-term goal for the operation, protection and development of ANR&WHS.

The vision of the ANR&WHS as part of the protected area network in the Klein Karoo is to conserve a system of sustainable living landscapes that is representative of the region's biodiversity and ecosystems through integrated management of formally protected areas, for the benefit of all.

2.2 The purpose of Anysberg Nature Reserve and World Heritage Site

The purpose is the foundation on which all future actions are based and is in line with the overall management philosophy of CapeNature.

According to Section 17 of NEM: PAA, the purpose of declaring an area as a protected area are:

a) to protect ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes in a system of protected areas;
b) to preserve the ecological integrity of those areas;
c) to conserve biodiversity in those areas;
d) to protect areas representative of all ecosystems, habitats and species naturally occurring in South Africa;
e) to protect South Africa's threatened or rare species;
f) to protect an area which is vulnerable or ecologically sensitive;
g) to assist in ensuring the sustained supply of environmental goods and services;
h) to provide for the sustainable use of natural and biological resources;
i) to create or augment destinations for nature-based tourism;
j) to manage the interrelationship between natural environmental biodiversity, human settlement and economic development;
k) generally, to contribute to human, social, cultural, spiritual and economic development; or

l) to rehabilitate and restore degraded ecosystems and promote the recovery of endangered and vulnerable species.

The ANR&WHS was declared for subsections a), b), c), e), f), g), i), k), l) and its purpose is to manage and conserve the unique and sensitive Succulent Karoo, Fynbos and Subtropical Thicket ecosystems and ecological processes of the area.

2.3 The values of Anysberg Nature Reserve and World Heritage Site

Values are those ecological, cultural and social characteristics that make the protected area unique. The values of ANR&WHS are listed in Table 2.1.

Table 2.1: Values of the Anysberg Nature Reserve and World Heritage Site.

Natural values	• Presence of unique biodiversity and high endemism. • Harbours populations of threatened riverine rabbit and Cape mountain zebra. • Contains numerous flora species of conservation concern. • Formally protects a large area of *ca.* 80 000 ha of natural habitat. • Inscribed as part of the CFRPA WHS extension. • Localized alien plant infestation that is being managed. • Has night skies that are free of light pollution. • Falls within an area where three globally recognised biodiversity hotspots converge (Fynbos, Maputoland-Tongoland-Albany Subtropical Thicket, Succulent Karoo). • Forms part of a larger protected area network.
Ecosystem service values	• Part of an important water catchment area, contributing to improved water flow regulation, infiltration, quality and quantity. • Provision of other ecosystem services, such as carbon sequestration, pollination, *etc.* • Part of the core area of the Gouritz Cluster Biosphere Reserve (GCBR). • Contributes to improved soil retention and condition through resting and restoration of veld. • Provides improved grazing for indigenous game. • Provision of scenic landscapes and solitude for tourism.
Social values	• Strong partnerships with governmental and non-governmental stakeholders. • Environmental awareness raising opportunities. • Local economic development opportunities. • Enthusiastic and passionate staff. • Strong leadership. • Research opportunities. • Staff development potential. • Many knowledgeable, concerned and involved neighbours and stakeholders.

	• Contains wilderness attributes.
Cultural and historic values	• Richness in archaeological and marine palaeontological sites.
Eco-tourism values	• Existing infrastructure of roads. • Natural and scenic beauty. • Peace and tranquillity. • Energy efficient facilities. • Variety of recreation activities offered (cycling, horse-riding, stargazing, botanising, hiking, birding, swimming, *etc.*). • Various accommodation options provided.

2.4 The objectives of Anysberg Nature Reserve and World Heritage Site

The objectives were derived from the vision and purpose and represent Key Performance Areas (KPA) to support the management intention. Objectives, which are not measurable or testable, are prioritised through the development of action plans and translated into strategic outcomes which are set out in the SIF.

The prioritised objectives are:

1. To conserve the natural ecosystems.
2. To manage the conservation estate effectively.
3. To secure the conservation estate.
4. To expand the conservation estate.
5. To promote biodiversity conservation awareness.
6. To promote sustainable utilisation of natural resources (including tourism).
7. To effectively conserve the cultural heritage attributes.

2.5 Summary of management issues, challenges, opportunities and threats of Anysberg Nature Reserve and World Heritage Site

A SWOT analysis is a strategic planning method used to evaluate the relevant strengths, weaknesses, opportunities, and threats. It involves specifying the objectives and identifying the internal and external factors that are favourable and adverse to achieving those objectives. The analysis identifies the following strengths, weaknesses, opportunities and threats for ANR&WHS (Table 2.2).

Table 2.2: Management challenges, opportunities and threats of Anysberg Nature Reserve and World Heritage Site.

	Obj 1	Obj 2	Obj 3	Obj 4	Obj 5	Obj 6	Obj 7
Strengths							
Management and scientific expertise		x					
Organisational stability		x					
Natural environment intact	x	x		x		x	
High diversity in fauna and flora	x	x	x	x	x		
Global hotspots	x	x	x	x	x		
Peace and tranquillity					x	x	

	Obj 1	Obj 2	Obj 3	Obj 4	Obj 5	Obj 6	Obj 7
Scenic environment		x	x	x			
Variety of recreation activities						x	x
Climate – activities can be provided all year around (*e.g.* hiking)		x			x	x	
Large geographical area	x	x		x			
Informed landscape corridor planning				x			
Integrated and coordinated planning	x	x	x	x			
Dedicated staff involved		x					
Research opportunities available	x	x			x		x
Presence of numerous rare and threatened plant species	x	x	x	x	x		
Sites of cultural and spiritual significance					x	x	x
Governmental and non-governmental partners	x	x					x
Knowledgable and involved neighbours and stakeholders		x			x		
Part of CFRPA WHS extension	x		x	x			x
Core area of GCBR					x	x	
Weaknesses							
Lack of capacity (staff numbers)	**x**	x					
Limited budget		x	x	x			
Difficult to source local contractors due to nature of roads and accessibility	x	x					
Poor involvement of community conservation as a result of budget and transport		x			x	x	
Long – boundaries create increased fence line to maintain and patrol	x	x					
Infrastructure problems due to floods damage	x	x					
Opportunities							
Existing partnerships (WWF-SA; LHSKT; GCBR)		x		x			
Expansion and biodiversity corridor development (Stewardship & purchases)	x	x	x	x			
Part of the GCBR	x	x	x	x	x	x	x
Tourism					x	x	
Training and development		x			x		
Environmental education					x	x	
Volunteer programmes		x			x		
Research	x	x		x	x	x	
Marketing & communication (internal & external)		x			x		
Threats							
Susceptible to invasive alien fauna and flora	x	x	x	x	x	x	
Floods	x	x		x	x	x	
Some fauna mortality from fencing (tortoises & smaller game)		x	x				
Biodiversity crime – stealing of plants, insects, reptiles and illegal hunting		x	x		x		
Impact of ostriches and certain game species on the reserve and difficulty to get game capture/cull initiated	x	x				x	

	Obj 1	Obj 2	Obj 3	Obj 4	Obj 5	Obj 6	Obj 7
Illegal access – the public roads make it easy for people to overnight on the reserve without paying.		x			x	x	
Fracking in the Karoo (potential impacts on groundwater)	x	x			x	x	
Impact of climate change	x	x		x	x		
Historical soil erosion	x	x	x	x	x		
Renewable energy developments on adjacent properties				x		x	
River and catchment degradation	x	x	x	x			

3) DESCRIPTION AND CONTEXT OF ANYSBERG NATURE RESERVE AND WORLD HERITAGE SITE

3.1 Location and extent of Anysberg Nature Reserve and World Heritage Site

ANR&WHS is located in the western Klein Karoo, between the towns of Laingsburg, Touwsrivier, Montagu and Ladismith. It falls within three local municipalities, viz: Laingsburg in the north, Langeberg in the southwest and Kannaland in the east. At district level it is located in the Central Karoo, Cape Winelands and Eden District Municipalities (Map 1).

The northern boundary of ANR&WHS roughly follows the northern foothills of Suurkloof se Berg from where it extends southwards over the Matjiesgoedberge, through the Vrede Vallei, over the Anysberg Mountain to the southern boundary of Touwsfontein (Maps 2 & 3). From its western boundary at the Kruis River to the eastern boundary at the Buffels River it covers a distance of about 60 km.

ANR&WHS is a large protected area, covering a total area of 79 629.4 ha, which includes state forest land on top of the Anysberg Mountain, declared mountain catchment areas, as well as land purchased by WWF-SA (Vrede Vallei, Kleinspreeufontein, Touwsfontein, Allemorgensfontein and Grand Canyon) (Map 2).

ANR&WHS falls within the Karoo Area of Region East of the Western Cape Nature Conservation Board. For management purposes it has been divided into six sectors shown on Map 2:

1. Anysberg Mountain
2. Vrede Vallei
3. Kleinspreeufontein
4. Touwsfontein
5. Allemorgensfontein, and
6. Grand Canyon.

The office complex is situated in the Vrede Vallei where most of the staff members are housed and which is also the location of the majority of the tourism infrastructure. The conservation manager resides at Goedehoop (also part of Vrede Vallei) and some staff stay in the units on Grand Canyon near the eastern main gate. The main road between Laingsburg and Ladismith cuts north-south across the Grand Canyon sector. There is also a public road running east-west from the Laingsburg-Ladismith road through the Vrede Vallei and Allemorgensfontein sectors towards Touwsrivier and Montagu (Maps 2 & 3).

ANR&WHS falls within the 3320AD, 3320BC, 3320BD, 3320CB, 3320DA, and 3321DB quarter degree grid cells. It is situated between the coordinates:

- Northernmost limit of reserve: 33° 28’ 46.3”S
- Southernmost limit of reserve: 33° 45’ 55.8”S
- Westernmost limit of reserve: 21° 21’ 03.9”E
- Easternmost limit of reserve: 22° 00’ 37.9”E.

The ANR&WHS comprises the land parcels listed in Table 3.1.

Table 3.1: Land parcels constituting the Anysberg Nature Reserve and World Heritage Site.

Reserve component	Farm name and number	Title deed number	Diagram number	Size (Ha)	Legal status	Noting sheet number
Anysberg	De Vlakte 263, Laingsburg			3 033.447	Management Agreement - Landowner	
Anysberg	Remainder of Portion 1 of the Farm De Vlakte No. 263, Laingsburg	T54716/1987	1819/1862	498.7871	Provincial Nature Reserve	BJ-4/3930
Anysberg	Portion 2 of the Farm De Vlakte No. 263, Laingsburg	T54716/1987	716/1878	206.4470	Provincial Nature Reserve	BJ-4/3930
Anysberg	Portion 3 (Goede Hoop) of the Farm De Vlakte No. 263, Laingsburg	T54716/1987	1549/1908	1 205.1405	Provincial Nature Reserve	BJ-4/3930
Anysberg	Portion 4 (Vrede) of the Farm De Vlakte No. 263, Laingsburg	T54716/1987	656//1912	1 331.6217	Provincial Nature Reserve	BJ-4/3930
Anysberg	Portion 1 (De Naald) of the Farm Tap Fontein No. 260, Laingsburg	T54716/1987	2121/1912	216.8868	Provincial Nature Reserve	BJ-4/3930
Anysberg	Remainder of the Farm Tap Fontein No. 260, Laingsburg	T54716/1987	3406/1884	3 227.9222	Provincial Nature Reserve	BJ-4/3930
Anysberg	Remainder of the Farm Anysberg-East No. 261, Laingsburg	T54716/1987	3401/1884	301.8733	Provincial Nature Reserve	BJ-4/3930
Anysberg	Portion 1 (Prins Poort) of the Farm Anysberg- East No. 261, Laingsburg	T54716/1987	1541/1908	2 363.1476	Provincial Nature Reserve	BJ-4/3930 & BJ6A/3937
Anysberg	Remainder of the Farm Anysberg-West No. 262, Laingsburg	T54716/1987	3154/1884	2 372.3452	Provincial Nature Reserve	BJ-4/3930 & BJ6A/3937
Anysberg	Portion 1 of the Farm Anysberg-West No. 262, Laingsburg	T54716/1987	2920/1921	475.9320	Provincial Nature Reserve	BJ-4/3930 & BJ6A/3937
Anysberg	Remainder of the Farm Keurkloof No. 265, Laingsburg	T54716/1987	3152/1884	1 911.2983	Provincial Nature Reserve	BJ-4/3930
Anysberg	Portion 3 (Klipbok Krans) of the Farm Witte Poort No. 259, Laingsburg	T54716/1987	2120/1912	228.0730	Provincial Nature Reserve	BJ-4/3930
Anysberg	Portion 1 of the Farm Kleynspreeuwfontein No. 177, Laingsburg	T51051/1987	493/1864	4 767.6641	Provincial Nature Reserve	BJ-4/3930
Anysberg	Remainder of Portion 2 (Springfontein) of the Farm Kleynspreeuwfontein No. 177, Laingsburg	T51051/1987	941/1907 (Part 1& 2)	986.0210	Provincial Nature Reserve	BJ-4/3930
Anysberg	Portion 3 (a portion of Portion 2) of the Farm Kleynspreeuwfontein No. 177 (Laingsburg)	T51051/1987	942/1907	961.8854	Provincial Nature Reserve	BJ-4/3930

Reserve component	Farm name and number	Title deed number	Diagram number	Size (Ha)	Legal status	Noting sheet number
Anysberg	Portion 4 (a portion of Portion 2) of the Farm Kleynspreeuwfontein No. 177, Laingsburg	T51051/1987	430/1908	800.7047	Provincial Nature Reserve	BJ-4/3930
Anysberg	The Farm Matjeskloof No. 175, Laingsburg	T51051/1987	3404/1884	1 529.5677	Provincial Nature Reserve	BJ-4/3930
Anysberg	The Farm Vyvers Hoek No. 176 (Laingsburg)	T51051/1987	3405/1884	1 354.5411	Provincial Nature Reserve	BJ-4/3930
Anysberg	Portion 2 of the Farm Annex Ezels Fontein No. 141, Laingsburg	T51051/1987	7944/1954	762.3219	Provincial Nature Reserve	BJ-4/3930
Anysberg	The Farm Keurkloof No. 167, Laingsburg	T51051/1987	3114/1884	1 216.0841	Provincial Nature Reserve	BJ-4/3930
Anysberg	The Farm Drie Hoek No. 264, Laingsburg	T54716/1987	3403/1884	323.6335	Provincial Nature Reserve	BJ-4/3930
Anysberg	The Farm Groot Vlakte No. 23, Montagu	T090079/2001	905/1869	1 877.6437	Provincial Nature Reserve	BJ-5BS/3932
Anysberg	The Farm Riet Kraal No. 22, Montagu	T090079/2001	906/1869	2 004.1321	Provincial Nature Reserve	BJ-5BS/3932
Anysberg	Remainder of the Farm Touwsfontein No. 1, Ladismith	T25577/1995	6152/1959	2 677.0346	Provincial Nature Reserve	BJ-6A/3937
Anysberg	Remainder of Portion 1 of the Farm Touwsfontein No. 1, Ladismith	T25577/1995	77/1869	998.4608	Provincial Nature Reserve	BJ-6A/3937
Anysberg	Portion 2 (portion of Portion 1) of the Farm Touwsfontein No. 1, Ladismith	T25577/1995	1635/1900	126.3799	Provincial Nature Reserve	BJ-6A/3937
Anysberg	Portion 3 (Valletjies siding) of the Farm Touwsfontein No. 1, Ladismith	T25577/1995	A44/1925	3.1306	Provincial Nature Reserve	BJ-5BS/3932
Anysberg	Portion 4 of the Farm Touwsfontein No. 1, Ladismith	T25577/1995	6151/1959	2 933.9961	Provincial Nature Reserve	BJ-5BS/3932
Anysberg	Annex Touwsfontein No. 2, Ladismith	T25577/1995	3036/1908	537.1484	Provincial Nature Reserve	BJ-6A/3937
Anysberg	The Farm Kookers Kloof No. 3, Ladismith	T25577/1995	2642/1909	221.7904	Provincial Nature Reserve	BJ-6A/3937
Anysberg	Portion 1 of the Farm Klipgat No. 4, Ladismith	T25577/1995	1634/1900	1 142.5209	Provincial Nature Reserve	BJ-6A/3937
Anysberg	Portion 2 of the Farm Klipgat No. 4, Ladismith	T25577/1995	1633/1900	1 017.5286	Provincial Nature Reserve	BJ-6A/3937
Anysberg	Remainder of the Farm Klipgat No. 5, Ladismith	T25577/1995	26/1867	66.0172	Provincial Nature Reserve	BJ-6A/3937
Anysberg	Portion 3 of the Farm Klipgat No. 6, Ladismith	T25577/1995	1637/1900	558.7972	Provincial Nature Reserve	BJ-6A/3937
Anysberg	Remaining extent of the Farm Riet Kloof No. 173, Laingsburg	T86255/2000	3150/1884	514.5373	Provincial Nature Reserve	BJ-3/3927

Reserve component	Farm name and number	Title deed number	Diagram number	Size (Ha)	Legal status	Noting sheet number
Anysberg	Portion 2 of the Farm Riet Kloof No. 173, Laingsburg	T86255/2000	3110/1914	1 362.1157	Provincial Nature Reserve	BJ-3/3927
Anysberg	Portion 1 of the Farm Keurkloof No. 265, Laingsburg	T86255/2000	5817/1902	477.3424	Provincial Nature Reserve	BJ-4/3930
Anysberg	Remaining extent of the Farm Kruis Rivier No. 20, Montagu	T86255/2000	4952/1944	1 997.0952	Provincial Nature Reserve	BJ-5BS/3932 & BJ-3/3927
Anysberg	Remainder of Portion 1 of the Farm Kruis Rivier No. 20, Montagu	T86255/2000	4953/1944	1 831.2400	Provincial Nature Reserve	BJ-5BS/3932 & BJ-3/3927
Anysberg	Remaining extent of the Farm Allemorgens Fontein No. 21, Montagu	T86255/2000	528/1832	1 880.4989	Provincial Nature Reserve	BJ-5BS/3932 & BJ-3/3927
Anysberg	Remainder of Portion 2 of the Farm Allemorgens Fontein No. 21, Montagu	T86255/2000	3109/1914	3 175.6695	Provincial Nature Reserve	BJ-5BS/3932 & BJ-3/3927
Anysberg	The Farm Spitskop No. 24, Montagu	T86255/2000	728/1870	3 003.7578	Provincial Nature Reserve	BJ-5BS/3932
Anysberg	Portion 4 of the Farm Allemorgens Fontein No. 21, Montagu	T61161/2012 (Not Micro filmed yet. Still need to get a copy from the Deeds Office.)	2028/1995	233.8504	Bought by WWF-SA in 2012. Not proclaimed yet. Previous Registered Owner David Alexander Hughes	BJ-5BS/3932
Anysberg	The Farm Annex Allemorgens Fontein No. 266, Laingsburg	T61161/2012 (Not Micro filmed yet. Still need to get a copy from the Deeds Office.)	3153/1884	1 151.1491	Bought by WWF-SA in 2012. Not proclaimed yet. Previous Registered Owner David Alexander Hughes	BJ-4/3930 & BJ-6A/3937
Anysberg	The Farm Wilger Fontein No. 258, Laingsburg (PART OF GRAND CANYON)	T31903/2012	1805/1884	1 298.7880	Provincial Nature Reserve – to be proclaimed	BJ-4/3930
Anysberg	Portion 1 of the Farm Wilger Fontein No. 258, Laingsburg (PART OF GRAND CANYON)	T31903/2012	622/1909	926.4821	Provincial Nature Reserve – to be proclaimed	BJ-4/3930
Anysberg	The Farm Witte Poort No. 259, Laingsburg (PART OF GRAND CANYON)	T31903/2012	308/1876	6 203.9726	Provincial Nature Reserve – to be proclaimed	BJ-4/3930

Reserve component	Farm name and number	Title deed number	Diagram number	Size (Ha)	Legal status	Noting sheet number
Anysberg	Remainder of Portion 1 of the Farm Witte Poort No. 259, Laingsburg (PART OF GRAND CANYON)	T31903/2012	499/1894	3 175.2726	Provincial Nature Reserve – to be proclaimed	BJ-4/3930
Anysberg	Portion 2 of the Farm Witte Poort No. 259, Laingsburg (PART OF GRAND CANYON)	T31903/2012	621/1909	1 227.1020	Provincial Nature Reserve – to be proclaimed	BJ-4/3930
Anysberg	Remainder of the Farm Anysberg Forest Reserve No. 7, Ladismith	Not available. Unregistered State land	It is a declared forest reserve and there is no diagram available.			BJ-6A/3937

3.2 History of Anysberg Nature Reserve and World Heritage Site

During the 1970s and 1980s the properties Vrede, Goedehoop, Tapfontein, Kleinspreeufontein, Keurkloof and Grand Canyon belonged to the Anstey family. They farmed with goats, merino sheep, cattle, lucerne and wheat. They also had a small herd of karakul sheep. Four big dams were built, called the 'Rooidamme', for the irrigation of the wheat fields located just below the dam wall and also for the lucerne fields lower down the valley.

During those years the railway line between Touwsrivier and Ladismith, which was completed in 1925, served the farming communities in the area. The railway line followed the Touws River through the Allemorgensfontein and Touwsfontein sectors. The train used to travel between Touwsrivier and Ladismith, stopping at the following stations: De Bron – Langverwacht – Blou Toring – Allemorgensfontein - Valletjies – Kareevlakte – Hondewater – Vensterkrans; and then turning at Ladismith. The steam engine used on this line was affectionately known as Makadas ('Make a dash').

There was a school at Vrede which remained in operation until 1988/89. The old Vrede homestead was used as a hostel for the children and also for the teacher and her family. The building next to the house was used as the school. Two additional classrooms were erected to accommodate the kids, but these were removed when the school closed in 1989.

During the Laingsburg flood of 1981, the railway line was severely damaged. It was never repaired and was eventually removed altogether. Contractors were used to remove most of the railway sleepers and steel which could be carried out. There are still steel tracks in certain areas on the reserve where it was too difficult to remove them (Johan Vaughan; pers. comm.).

After the devastating Laingsburg flood destroyed the railway line, all the above-mentioned properties were sold to Mr Adriaan van den Berg. His aim was to manage the area as a nature reserve. Unfortunately he introduced extra-limital species such as plains zebra (*Equus burchelli*), Hartmann's zebra (*Equus zebra hartmannae*) and European fallow deer (*Cervus*

dama). These species were later removed by CapeNature after the properties were bought from him.

About a year later Mr van den Berg sold the Grand Canyon property to Mr Michael Kroon. The same property was later sold to Mr Stephan le Roux from whom WWF-SA bought the property in 2012 (Johan Vaughan; pers. comm.).

The first properties were acquired by the Cape Directorate of Nature Conservation and Environmental Affairs (Martin *et al*. 1989) through a purchase by the South African Nature Foundation, now the WWF-SA. In 1986 negotiations started for the purchase of three farms, Vrede, Keurkloof and Kleinspreeufontein, and in 1988 these negotiations were successfully completed (Martin *et al.* 1989). The motivation for the purchase was the diversity of plant species and because the area was regarded as an important catchment for the Prinspoort Dam, situated directly south of where the Prins River cuts through the Anysberg Mountain (Maps 1 & 2).

The southern part of the Anysberg Mountain was initially acquired by the Department of Forestry to investigate the planting of trees for timber production and declared as a Demarcated Forest in 1936 in terms of the Forest Act, 1913 (Act 16 of 1913). In 1984 the same area was set aside as a Forest Nature Reserve in terms of the amended Forest Act of 1968. The area was managed from the Garcia State Forest near Riversdale, but then transferred to Towerkop State Forest after the northern part of Anysberg Mountain was declared as Private Mountain Catchment Area. Some surviving pine trees, as well as some of the planted *Widdringtonia cedarbergensis* were eradicated. Rumour has it that there are still some live individuals of this species on the southern slopes of the mountain, near the small shelter that was constructed for the field ranger from Garcia Forest Station to sleep over (Tierck Hoekstra; pers. comm.).

In 1995, with funding from the Lesley Hill Succulent Karoo Trust (LHSKT), the WWF-SA was able to acquire the farm Touwsfontein from Mr Crabtree, thereby extending the area under conservation to 44 515 ha. This farm was purchased for its rich succulent plant species diversity.

The farm Allemorgensfontein (14 242 ha) was purchased by WWF-SA in 2000, with funding provided by the LHSKT. The farm belonged to Mr Bill Burger and included the Kruisrivier and Boplaas areas. It was utilised mainly for grazing by goats and sheep, but there was also some lucerne at Boplaas (Johan Vaughan; pers. comm.). Motivation for the purchase was based on the additional Succulent Karoo plant species that would be conserved, the *ca.* 14 km of riverine habitat that would be captured, as well as the consolidation of the Vrede and Touwsfontein sectors.

In 2001 Mr George Moggach donated his properties, Groot Vlakte and Rietkaal (3 882 ha), to WWF-SA to be added to the then Anysberg Nature Reserve. These properties fall within the Touwsfontein sector.

In 2012 the Grand Canyon property was purchased by WWF-SA with funding from the LHSKT. The main reasons for purchasing this land were because of the high succulent plant species diversity found in the area and to link the Anysberg with the Klein Swartberg Mountains. Almost at the same time the property of Mr Hughes located at the western end of Anysberg Mountain was put on the market, and also purchased by WWF-SA. Both properties are currently managed as part of the ANR&WHS. Today ANR&WHS is 79 629.4 ha in size.

The expansion of ANR&WHS from the initial 5 197 ha of forest nature reserve located on the Anysberg Mountain, to the current 79 629.4 ha is truly remarkable. Motivations for expansion were primarily based on the importance for water catchment of the additional areas, the Succulent Karoo and Fynbos biodiversity that would be protected, as well as the establishment of ecological corridors along west-east and north-south gradients.

ANR&WHS falls within the core area of the GCBR, South Africa's seventh biosphere reserve that was designated by UNESCO on the 9th June 2015, and on the 3rd July 2015 Anysberg was inscribed as part of the serial site extension of the CFRPA WHS approved by UNESCO. The World Heritage Convention Act, 1999 (Act 49 of 1999) provides for the enforcement and implementation of World Heritage in South Africa.

3.3 Ecological context of Anysberg Nature Reserve and World Heritage Site

This section reflects the ecological conditions of ANR&WHS.

3.3.1 Climate and weather

ANR&WHS is situated in the region which has a bimodal rainfall, transitional between the summer and winter rainfall regions. The South Africa 1:250 000 rainfall map sheet 3320 Ladismith, indicates that there is a variation in rainfall topography, the higher lying mountains in the north and south having a higher average annual rainfall (500 mm) than the lower lying valleys (200 mm) with the central mountainous area (Matjiesgoedberg) receiving approximately 400 mm per annum.

There are currently nine active rainfall-stations on the ANR&WHS. The graph in Figure 3.1 shows rainfall data from four of these stations. Anysberg station is located on top of the Anysberg Mountain, while Leendertskraal represents rainfall of the northern hills. Vrede represents rainfall in the valley towards the east of the reserve, while Touwsfontein is at the south-western end of the reserve.

In general, average annual rainfall ranges from 160-210 mm in the valleys to 290-330 mm on the higher mountainous areas.

Snowfalls may occur in July, August and occasionally September. Mist is common on the high-altitude peaks throughout the year.

Temperature data for the area are almost non-existent. The most reliable temperature data are from the automatic weather station on top of the Anysberg Mountain. The average minimum temperature is 5˚C and the average maximum is 32˚C. The average temperatures for winter are 3˚C and 15˚C and for summer 26˚C to 35˚C.

Prevailing winds are mostly north-north-westerly, with the occasional south-easters. Rain mostly follows south-westerly cold fronts. Berg winds occur in winter heralding the approach of cold fronts.

Maximum day lengths are about 15 hours in January and December. The minimum day lengths are about 9 hours in June and July.

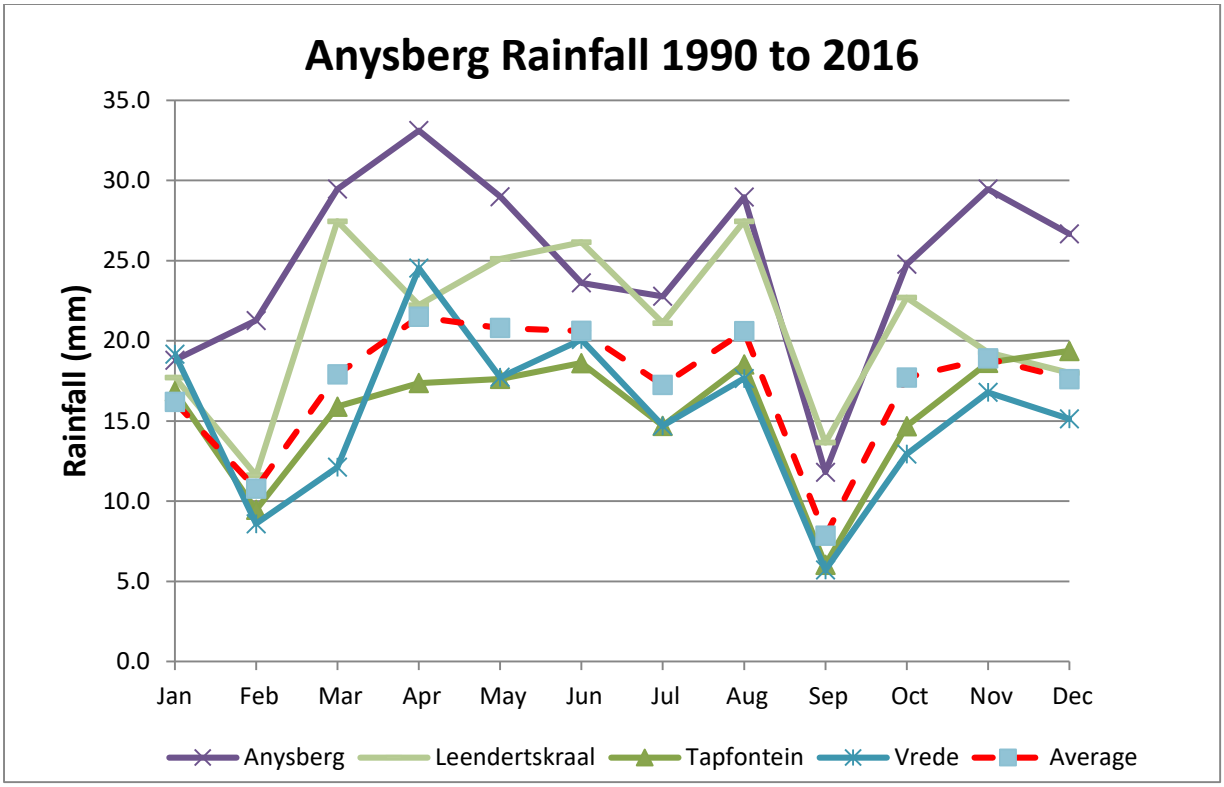

Figure 3.1: Total monthly rainfall recorded at four rain gauges, with the average from eight active rain gauges spread throughout Anysberg Nature Reserve and World Heritage Site.

3.3.2 Topography

ANR&WHS is a rugged, rocky, semi-arid area characterised by high relief and varied topography, reflecting its location within the heart of the Cape Fold Belt of South Africa. Elevations here range from 1621 m a.m.s.l. along the crest of the Anysberg Mountain down to slightly less than 500 m a.m.s.l. along the Buffels River on the eastern edge of the reserve (Map 3). High relief is promoted by (1) tight folding and faulting of the sedimentary bedrocks in conjunction with (2) the stratigraphic alternation of tough sandstone or quartzite rock units with less resistant-weathering mudrocks within the dominant Cape Supergroup succession *plus* (3) the complex history of crustal uplift, drainage incision and sea-level change in southern Africa since the break-up of Gondwana (Almond & Browning 2015).

The Anysberg–Prinsberg mountain chain at the core of the reserve, linking with the Klein Swartberg Range on its south-eastern margin are examples of the whale-backed, west-east orientated anticlines built of hard-weathering Table Mountain Group rocks that typify the Klein Karoo region in the central Cape Fold Belt. Karstic (solution) weathering of quartzitic rocks on the summit plateaux as well as the incision of the mountain flanks by innumerable narrow stream gorges or 'klowe' have generated spectacularly rugged scenery reminiscent of the Cederberg Mountains. Smaller-scale folding of the Bokkeveld and Witteberg Group rocks to the north of the Anysberg has generated a strongly-marked west-east fabric to the terrain here, clearly seen in satellite images. The Witteberg Group, rich in sandstones and quartzites, builds higher and steeper mountain slopes in the northern sector of the reserve (*e.g.* Matjiesgoedberge, Skerpkrans) with peaks and ridges between 1 000 and 1 500 m a.m.s.l. The mudrock-rich Bokkeveld Group underlies more subdued hilly, "ridge and valley" or hogsback

terrain around the margins of the Anysberg (*e.g.* Anysrivier Valley) as well as the flatter, gravel-capped *vlaktes* in the south-western part of the reserve and the lowlands to the north-east of Klein-Spreeufontein.

ANR&WHS is largely situated in highly-dissected terrain between two major, deeply-incised branches of the Gouritz drainage system – the Touws River in the west and the Buffels River in the east. These ancient river systems were first established following the break-up of Gondwana in Early Cretaceous times. Starting at the coast their headwaters cut their way through the Cape Fold ranges and into the Great Karoo of the interior by a process of aggressive headward erosion. River incision across the resistant Table Mountain Group anticlines such as the Anysberg and Klein-Swartberg during past wetter climatic intervals of the Cretaceous to Middle Tertiary period was facilitated by episodic crustal uplift. This rejuvenated the vigorous river systems, increasing their erosive power. The result is the spectacular narrow, steep-sided gorges such as Prinspoort and Buffelspoort which are now occupied by comparatively small, intermittently-flowing rivers or streams reflecting increasing aridity in recent geological times (Maps 2, 3). Crustal uplift and consequent stream down-cutting also promoted the development of narrow stream *klowe* – now normally dry - into both northern and southern flanks of the Anysberg (*e.g.* the deep Land se kloof and numerous other unnamed examples). At the same time wider, east-west tributary stream valleys were developed along the grain of the Cape Fold Belt. An example is the Anysrivier that runs along the northern flank of the Anysberg (Vrede Vallei) into Prinspoort, exploiting the zone of comparatively easily-eroded, deeply-weathered Bokkeveld Group rocks here. Alternating episodes of (1) crustal uplift and concomitant river down-cutting with (2) periods of relative stability have left their mark on the landscape in the form of a series of relict, dissected land surfaces or *pediments*. These flat to gently-sloping surfaces are often capped by colluvial and alluvial gravels as well as pedocretes (*i.e.* cemented gravels, sands and soils such as calcrete and silcrete). The pediment surfaces cut across the underlying folded bedrocks and increase successively in age with increasing height above modern river level. A very old pediment surface truncating dipping beds of Table Mountain quartzite at *ca.* 900-1000 m a.m.s.l. can be seen along the summit of the Anysberg – Prinsberg (*e.g.* along the rim of Prinspoort). A dissected, south-sloping pediment surface (*ca.* 850 – 600 m a.m.s.l.) with a locally silcretised gravel capping runs along the south-western margin of the Anysberg. A possible extension of this same surface (*ca.* 700-600 m a.m.s.l.), as well as other lower and younger ones, extend across the gravel-strewn *vlaktes* in the south-western part of the ANR&WHS and along the banks of the Touws River. Rapidly fluctuating sea levels during the Pleistocene Period related to the alternating growth and melting of the Antarctic ice cap have also affected river behaviour along the South African continental margin (*e.g.* downcutting *versus* deposition), but the nature and scale of their influence deep within the Cape Fold Belt is poorly understood (Almond & Browning 2015).

3.3.3 Geology and soils

ANR&WHS is a very scenic, highly-dissected, mountainous area embedded deep within the southern branch of the Cape Fold Belt of the Western Cape, South Africa. Among the CapeNature protected areas, the ANR&WHS is one of the most complex and interesting in terms of its geological structure as well as the large number of sedimentary rock units represented here (Map 4). Around 30 different formations spanning an age range of about 430 million years (Silurian Period to Recent) are present within the reserve, although not all of these have as yet been mapped at surface (Map 4). The complex geological history of the

ANR&WHS is a major factor underpinning the wonderful variety of topography, soils and hence vegetation types found within this protected area. In addition, a number of scientifically important – and conservation worthy – geological and fossil sites have been recorded here in recent years.

The great majority of the ancient sedimentary bedrocks within the reserve (23 formations) belong to the Cape Supergroup (Map 4). This is a package of marine, coastal, fluvial, lacustrine and glacial rocks with a total thickness of up to 10 km that was laid down on the Supercontinent Gondwana between *ca*. 470 and 330 million years ago (Ordovician to Carboniferous Periods). Representatives of the Table Mountain Group (3 formations), Bokkeveld Group (13 formations) as well as the Witteberg Group (7 formations), in order of decreasing age, occur here. The Anysberg Mountain itself is built of resistant-weathering fluvial sandstones and quartzites of the Table Mountain Group. These beds were compressed into a major west-east trending anticline (upfold) during the formation of the Cape Fold Belt in the Permo-Triassic period (Figure 3.2). Excellent cross-sections through the impressively thick Table Mountain Group rock succession can be seen in the Prinspoort and Land se Kloof gorges, for example. The alternating mudrocks and sandstones of the Bokkeveld Group form the ridge-and-valley terrain in the foothills of the ANR&WHS as well as the undulating *vlaktes* and hilly areas in the south-western portion of the WHS. The very rugged mountainous country in the northern portion of the reserve, extending up to the Witteberge, is largely underlain by quartzite-rich successions of the Witteberg Group. There is additionally a small area of younger Karoo Supergroup rocks on the north-western margins of the reserve, represented by *ca.* 300 million year-old glacial deposits of the Dwyka Group (Almond & Browning 2015).

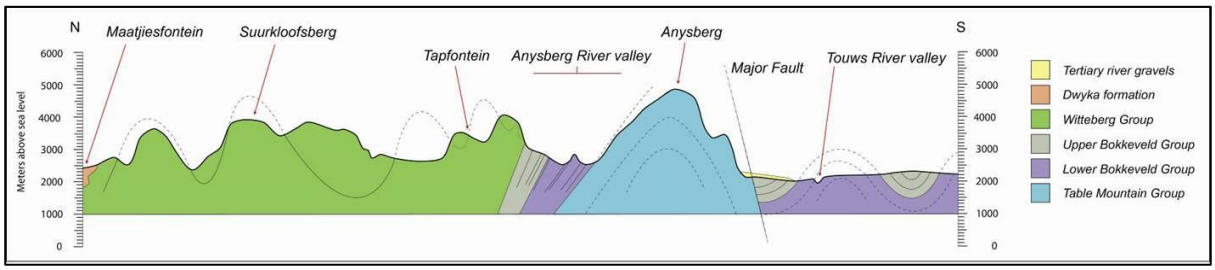

Figure 3.2: North-south geological section across the Anysberg Nature Reserve and World Heritage Site showing the broad geological structure of the region. The Anysberg itself represents a large-scale east-west anticline (upfold) of Table Mountain Group rocks. The Witteberg Group rocks in the northern sector of the reserve show high levels of intense folding and faulting due to crustal-compression during the formation of the Cape Fold Belt (Permo-Triassic period). A major fault plane running along the southern edge of the Anysberg is associated with crustal stretching during the break-up of Gondwana in Jurassic-Cretaceous times.

In many parts of the ANR&WHS these Palaeozoic bedrocks are mantled by a diverse spectrum of geologically youthful superficial sediments. They include river and stream alluvium, colluvium or slope deposits (*e.g.* scree) *plus* ancient cemented soils and rock rubble (pedocretes) such as calcrete, silcrete and ferricrete. Most of these younger deposits are probably of Pleistocene age or younger (*i.e.* last 2.5 million years). However, some of the

better-cemented examples - such as the relict patches of silcretised pediment gravels on the flanks of the Anysberg and older, calcretised and gravelly alluvium associated with the Touwsrivier drainage system - may be substantially older. They may well extend back into the Late Tertiary (Neogene) Period, although this has not yet been unequivocally established. The presence of a number of relict patches of ancient, gravel-capped land surfaces within the reserve reflect a long and complicated history of drainage evolution within the southern Cape Fold Belt, driven by repeated pulses of continental uplift and consequent river incision as well as by climate-driven sea-level changes (Almond & Browning 2015).

A number of geological highlights have been identified within the ANR&WHS. They are all conservation-worthy, but only a few are considered to be vulnerable to disturbance at present. All scientifically important geological sites in the RSA are protected by the National Heritage Resources Act, 1999 (Act 25 of 1999) and may not be damaged or disturbed without a permit from the relevant heritage resources management authority (in this case Heritage Western Cape).

Among the geological highlights of the ANR&WHS that are of potential geotourism and research interest include the following (Almond & Browning 2015):

- Deeply-incised stream and river gorges cutting into the Anysberg Mountain, most notably the Prinspoort that cuts right across the mountain, Land se Kloof as well as numerous other unnamed 'klowe' along the mountain front (Figure 3.3A);
- Fantastic karst (solution) weathering features of quartzitic rocks on the very rugged Anysberg plateau, probably of Tertiary age and similar to those seen in the Cederberg region (Figure 3.3B);
- Outstanding hillslope exposures of the Middle Devonian Karoopoort Formation (uppermost Bokkeveld Group), a rock unit that is normally very poorly exposed within the Cape Fold Belt (Figure 3.3C);
- Excellent examples of shallow marine debris flow deposits associated with a poorly-known Late Devonian / Early Carboniferous glacial event on Gondwana;
- Evidence for intense crustal compression of the Witteberg Group rocks during formation of the Cape Fold Belt, in the northern portion of the reserve in the form of large scale recumbent (overturned) and cascade folding as well as probable thrust faults (Figure 3.3D);
- The major fault scarp along the southern face of the Anysberg, related to crustal stretching during the break-up of Gondwana, associated with quartz veins and spring lines (Figure 3.3E)
- Relict patches of spectacular silcretised (silicified) pediment gravels of probable Late Tertiary age on the southern face of the Anysberg;
- An undescribed formation of ancient gritty to gravelly alluvial deposits associated with the Touwsrivier drainage system in the western portion of the reserve (Figure 3.3F).

These geological sites are protected by law but are not considered to be especially vulnerable.

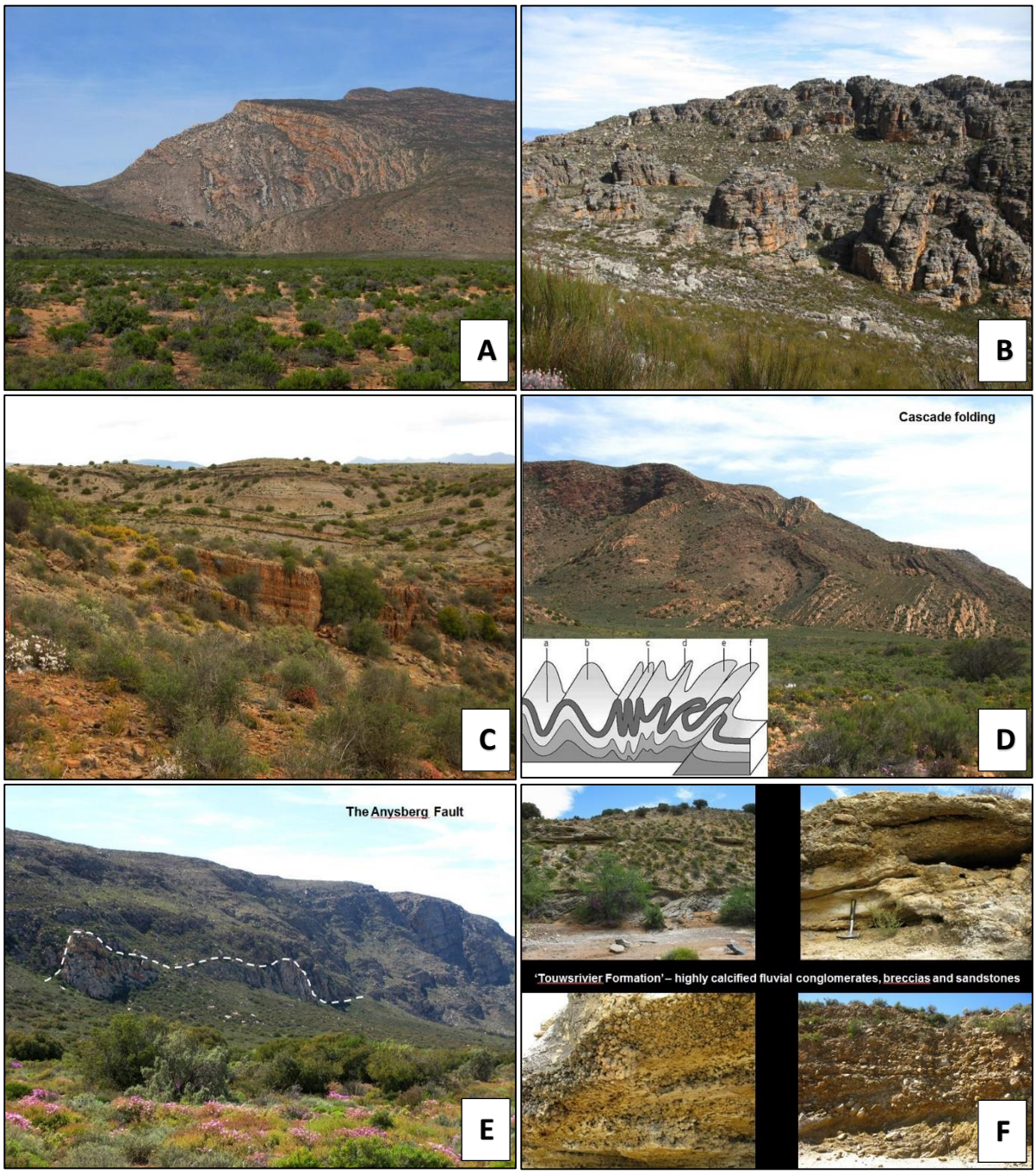

Figure 3.3: Geological features present on Anysberg Nature Reserve and World Heritage Site. A, Prinspoort gorge was carved right through the Anysberg Mountain by headwards river erosion, from south to north, under the influence of rapid crustal uplift in Late Tertiary times. B, Examples of karstic "ruiniform" weathering seen on the Anysberg Mountain. C, Some of the best exposures known of the mudrock-dominated Karoopoort Formation at the top of the Bokkeveld Group (Middle Devonian) as seen in the Touwsfontein sector. D, Spectacular cascade folding of Witteberg Group quartzites in the Kleinspreeufontein sector indicate intense crustal compression during formation of the Cape Fold Belt. E, A major west-east fault line along the southern face of the Anysberg – here clearly picked out by thick veins of pale quartz – is of very ancient origin; several groundwater springs occur along the fault line. F, Thick calcified gravels and sands in the western part of the reserve are associated with the early depositional history of the very old (Cretaceous / Tertiary) Touwsrivier drainage system and may be recognised in future as a separate sedimentary formation. (Photos and text from Almond & Browning 2015.)

3.3.4 Aquatic systems

The ANR&WHS falls within the greater Gouritz Water Management Area (WMA). More specifically, the ANR&WHS falls into the Groot and Touws River sub-catchments of this WMA (River Health Programme (RHP) 2007; Map 5). The rivers flowing through the properties drain the lower slopes and mountains of the surrounding areas towards the two sub-catchments, with the Touws River eventually joining the Groot River several kilometres upstream of Vanwyksdorp. The Groot River in turn, then flows into the Gouritz River several kilometres downstream of Vanwyksdorp. Due to the low rainfall and the resulting semi-arid to arid nature of the area, most of the rivers, especially smaller tributaries flowing through the ANR&WHS are seasonal (or non-perennial), and in some cases even ephemeral, with dry water courses. Even the Touws and Groot Rivers dry up to some extent during the drier summer season, with very little to no flow and forming large pools in the deeper parts of these rivers.

The stream originating at Land se Kloof on the Anysberg Mountain supplies water to the office, accommodation units and staff houses in the Vrede Vallei. This stream has always supplied a sustained flow of high quality water throughout the year. However, for the first time in history there is a concern about the sustainability of the water supply from Land se Kloof due to the current drought conditions. This has never been the case before.

Major impacts on the hydrological functioning of the aquatic systems in the greater surrounding catchments of the ANR&WHS land parcels include the presence of livestock and resulting trampling of the river banks and beds; some parts also apply irrigated agriculture for lucerne and pastures.

3.3.4.1 Groundwater

The groundwater systems associated with the ANR&WHS fall within the Table Mountain Group aquifers, which extend from near Niewoudtville in the north-west, down to Cape Agulhas and eastwards toward Port Elizabeth (De Beer 2002). The underlying geology of the upper catchment of the Gouritz WMA (including the Anysberg area), however, comprises the Karoo sediments and doleritic intrusions, together with quartzite and Malmesbury group conglomerates which are overlain by alluvial deposits in the valley floors (RHP 2007).

According to the Department of Water Affairs and Sanitation Aquifer Classification Map, the aquifer system is found to be mostly minor, which means a moderately yielding system of variable water quality, with a small major (*i.e.* high yielding, with good water quality) sliver coming up from Ladismith (Department of Water Affairs (DWA) 2012a). These classifications are reflected to some degree in the groundwater quality of the general area, where the conductivity falls mostly in the higher than 520 mS/m, meaning that the water has an extremely salty and bitter taste. The saltiness decreases slightly towards Laingsburg and Matjiesfontein (370-520 mS/m) and Ladismith (70-150 mS/m) (DWA 2012b). Moreover, the vulnerability (likelihood for contamination to reach a specific position) of the aquifer system varies from being moderately to least vulnerable below Touwsrivier town and most to least vulnerable below Matjiesfontein. Here “least vulnerable” entails a vulnerability only to conservative pollutants entering the system over a long time period, but only when it is

continuously discharged or leached (DWA 2013a). Moderately vulnerable in turn, indicates a vulnerability to some pollutants, but again only when it is continuously discharged or leached into the system. Most vulnerable then indicates a vulnerability to many pollutants. Both of these principles, *i.e.* classification and vulnerability, in turn, feed into the susceptibility of an aquifer region to be polluted by anthropogenic impacts. In the case of the aquifer systems supporting the freshwater ecosystems of the ANR&WHS, the susceptibility ranges from low to medium (patches between Touwsriver and Ladismith), to high (between Laingsburg and Ladismith; DWA 2013b).

Current groundwater abstraction on the ANR&WHS takes place at eight boreholes (Map 5). Six of these boreholes are pumped on a daily basis for domestic use. The borehole at Tapfontein is also pumped daily, but the water is used to supply the swimming dam. The boreholes at Vaughanville and Touwsfontein supply good quality drinking water, but the water quality of the other six boreholes is too brackish for drinking.

Government has given the go-ahead for shale gas development in the Karoo region. The proposed fracking in the Karoo north of ANR&WHS could potentially have a negative impact on groundwater levels and aquifers, as well as result in groundwater pollution. A monitoring system would need to be put in place and implemented in ANR&WHS should the fracking go ahead.

3.3.4.2 Rivers

There are several rivers running through the ANR&WHS, the major ones include the Touws, Anys, Prins and Buffels Rivers. On the western side of the ANR&WHS, the Doring River enters the Kruis River at the border of the Kruisrivier property (land parcel 12102). The Kruis River then flows into the Touws River on the Allermorgensfontein property (land parcel 31833). From here the Touws River flows down to the Touwsfontein property (land parcel 30462), where it is joined by the Stinkfontein se Rivier, from where it exits ANR&WHS at the Klipgat property.

North of the Anysberg Mountain the Elandskloof River enters the Vrede Vallei sector on the Driehoek property (land parcel 11314) and it is here where it becomes the Anys River. The Prins River enters the Grand Canyon sector from the north and is joined by the Anys River at Prinspoort from where it eventually flows into the Prinspoort Dam. On the far eastern border of ANR&WHS, the Buffels River actually runs along the border of the Wilgerfontein property and once joined by the Klein-Swartberg River from the east (corner of Wilgerfontein 30928 land parcel), it becomes the Groot River.

Of these rivers, and their tributaries, only a few have been given a Freshwater Ecosystem Priority Area (FEPA catchment) status, through the National Freshwater Ecosystem Priority Areas (NFEPA) project (see Table 3.2 for the NFEPA and condition status of the main stem rivers and their tributaries).

Table 3.2: The NFEPA status and estimated health condition of the rivers of the ANR&WHS. Health scores are defined as follows; natural (A), good-natural (AB), good (B), fair (C), degraded (D).

Catchment	Sub catchment	River	Condition*	FEPA status
Touws	Kruis	Doring	AB	Not FEPA
		Kruis above confluence with Doring River	AB	Not FEPA
		Kruis below confluence with Doring River	AB	FEPA catchment
Gouritz	Groot	Touws	C/D	Not FEPA
Groot	Touws	Stinkfontein	AB	Not FEPA
Groot	Touws	Prins upper	C	Not FEPA
		Prins lower	AB	Not FEPA
Touws	Prins	Anys	AB	Not FEPA
Gouritz	Groot	Buffels	C	FEPA fish corridor

**Condition estimated through a combination of real data, desktop study and specialist input.*

3.3.4.3 Other freshwater aquatic systems (wetlands, springs, pans)

Only one priority wetland system [found in CBAs] and those found in NFEPAs (Nel *et al.* 2011a, b)] was mapped near the Annex Ezelsfontein section border of the ANR&WHS. In fact, this system includes two bench flat wetlands and a hillslope seep, grouped together in a wetland cluster (Nel *et al*. 2011a; see Ollis *et al*. 2013 for wetland type descriptions). According to the NFEPA wetland GIS layer, these wetlands are located within the Western Fynbos – Shale Renosterveld regional wetland vegetation type. Furthermore, alone, these wetlands are not considered priorities, but together as a wetland cluster the system is of conservation importance. The only other so called wetlands that were mapped during the NFEPA process are all artificial, *i.e.* dams.

3.3.5 Flora

The ANR&WHS is located in the heart of the Klein Karoo where the Fynbos, Succulent Karoo and Maputuland-Tsongoland-Albany Thicket biomes, three globally recognised biodiversity hotspots, come together.

The vegetation of the area has been mapped nationally at a 1: 1 000 000 scale (Mucina & Rutherford 2006) and regionally at a fine-scale at 1: 50 000 (Vlok *et al*. 2005).

3.3.5.1 National vegetation map

According to the South African Vegetation Map (Mucina & Rutherford 2006) there are eight different vegetation types on the ANR&WHS. These are listed in Table 3.3 and illustrated on Map 6.

Anysberg Mountain comprises mainly Fynbos vegetation types (North Swartberg Sandstone Fynbos and South Swartberg Sandstone Fynbos) (Map 6). The Kleinspreeufontein sector and the northern sections of the Vrede Vallei and Allermorgensfontein sectors consist mainly of Matjiesfontein Quartz and Shale Fynbos types and Matjiesfontein Shale Renosterveld. Grand Canyon, the remainder of Vrede Vallei, Allemorgensfontein and the majority of Touwsfontein sectors consist of the Western Little Karoo vegetation type. Along the southern foot of the Anysberg Mountain is a portion of Montagu Shale Renosterveld vegetation which is classified as Vulnerable (Pence 2014). All other vegetation types are listed as Least Threatened according to Pence (2014). Full descriptions of vegetation types are given in Mucina and Rutherford (2006) and are not repeated here.

Table 3.3: Vegetation types occurring in the Anysberg Nature Reserve and World Heritage Site according to the South African Vegetation Map (Mucina & Rutherford 2006). The biome, size and percentage of target captured, conservation and protection status of each vegetation type are also given (Pence 2014).

Vegetation Type	Biome	Ha captured (% of target)	Conservation Status	Protection Status
North Swartberg Sandstone Fynbos	Fynbos	11 264.5 (51.8%)	Least Threatened	Well protected
South Swartberg Sandstone Fynbos	Fynbos	6 990.3 (24.6%)	Least Threatened	Well protected
Matjiesfontein Quartzite Fynbos	Fynbos	6 200.7 (18.1%)	Least Threatened	Poorly protected
Matjiesfontein Shale Fynbos	Fynbos	3 079.6 (100%)	Least Threatened	Well protected
Matjiesfontein Shale Renosterveld	Fynbos	10 451.2 (18.5%)	Least Threatened	Poorly protected
Montagu Shale Renosterveld	Fynbos	2 844.4 (6.6%)	Vulnerable	Poorly protected
Little Karoo Quartz Vygieveld	Succulent Karoo	423.0 (11%)	Least Threatened	Poorly protected
Western Little Karoo	Succulent Karoo	38 376.2 (58.4%)	Least Threatened	Moderately protected

3.3.5.2 Regional fine-scale vegetation map

A detailed, fine-scale vegetation map was compiled at a 1:50 000 scale for the Klein Karoo by Vlok *et al*. (2005). This map illustrates the complexity in the landscape resulting from the merging of the three biomes and the effect of key environmental factors, such as the variation in geology, annual rainfall, temperature regimes and the dependence on fire (Vlok & Schutte-Vlok 2010). A total of 369 different vegetation/habitat units are identified and described (Vlok *et al*. 2005). Each of the habitat units consists of a unique assemblage of species, some of which are endemic to the particular habitat unit.

From a management point of view, this fine-scale map is more practical and useful to inform management actions. According to the map, 40 vegetation units occur on the ANR&WHS, 37 of which are terrestrial and three aquatic (Map 7).

A brief description (taken from Vlok *et al*. 2005) and notes on the current ecological condition and the utilisation of each by game species are given below. According to Reyers and Vlok (2008) and Skowno *et al.* (2010) all the vegetation units are Least Threatened, except for the Buffels River and Floodplain which is classified as Endangered. Name changes of species documented in Manning and Goldblatt (2012) are included.

Full species lists are not provided in the management plan. If required, species lists are available on request from Scientific Services, Assegaaibosch Nature Reserve, Jonkershoek, Stellenbosch.

Terrestrial vegetation units

- **Fynbos Biome**

Anysberg Mesic Proteoid Fynbos – 703 ha of this unit occur on Anysberg Mountain. It is restricted to sandy soils derived from the Skurweberg formation that are located on the moist upper southern slopes of the Anysberg Mountain. It is most easily recognized by the relative abundance of species such as *Brunia nodiflora, Cannomois virgata, Protea eximia* and *Protea punctata*. Ericoid, restioid and graminoid elements are often co-dominant, with species such as *Agathosma capensis, Cliffortia mirabilis, Clutia laxa, Elegia filacea, Erica anguliger, Erica copiosa, Erica plukenetii, Hypodiscus synchroolepis, Leucadendron salignum, Pentameris macrocalycina, Phylica lanata, Rhodocoma capensis, Rhodocoma fruticosa* and *Tetraria cuspidata* abundant. A rich variety of other species, such as *Agathosma barnesii, Agathosma ovata, Cyclopia intermedia, Erica selaginifolia, Leucadendron barkerae, Leucadendron comosum, Leucadendron eucalyptifolium, Leucadendron rubrum, Leucadendron salicifolium, Pelargonium laevigatum, Restio burchellii, Restio triticeus, Stoebe plumosa, Vexatorella obtusata* subsp. *albomontana* and *Watsonia marlothii* are also present and characteristic of this unit. A number of highly localized endemic species are known from the upper peak sites, such as *Adenandra dahlgrenii, Disa lineata, Erica* sp.nov. (cf. *E. lehmannii*) and *Muraltia bondii*. This unit is in a pristine condition, and is utilised mainly by klipspringer and would probably also be browsed by Cape mountain zebra especially after fires, should the population increase in size.

Anysberg Arid Proteoid Fynbos – A total of 8 825 ha of this unit occur on Anysberg Mountain. It is restricted to sandy soils, often shallow and rocky, that is derived from the Skurweberg formation. The local species dominance varies much, depending on aspect, slope and the depth of the soil, but this unit is easily recognized by an abundance or dominance of species such as *Aspalathus rubens, Cannomois scirpoides, Erica rosacea, Hypodiscus aristatus, Hypodiscus striatus, Leucadendron pubescens, Leucadendron rubrum, Leucospermum wittebergense, Metalasia pallida, Passerina vulgaris, Pentameris macrocalycina, Phylica lanata, Protea laurifolia, Protea lorifolia, Protea repens, Restio hystrix* (= *Ischyrolepis hystrix*) and *Thamnochortus rigidus*. This unit is structurally similar to the Matjiesgoed Fynbos that

occurs on the Witteberg, but differs in the species present. Species such as *Leucadendron teretifolium* are absent, while others such as *Leucospermum wittebergense* are present. Included in this unit are the Fynbos related communities that occur in the ravines on the southern and northern slopes. These communities differ much from those on the open slopes and have species such as *Anisodontea reflexa, Anisodontea triloba, Psoralea affinis* and *Psoralea sordida* present. The rocky slopes of these ravines harbour many succulents such as *Aloe comptonii*, some of which are uncommon species such as *Haworthia wittebergensis*. Rare and endemic species known to be present in this unit include *Aspalathus* sp.nov. (cf. *Aspalathus sceptrum-aureum-acanthes*), *Cliffortia conifera, Disperis bodkinii* and *Erica insignis*. This unit is in a pristine condition. It is utilised by klipspringer, eland and gemsbok. It is also likely to be utilised by Cape mountain zebra, should the area burn and the population size increase.

Anysberg Arid Asteraceous Fynbos – This unit (2 313 ha) is restricted to arid north facing slopes of the Anysberg Mountain, where the shallow sandy soils are mostly derived from the Skurweberg formation. Along its lower margin this unit occurs also on the Rietvlei formation, where the soils are also very shallow, but have a higher clay content and thus have a higher nutrient status. Some graminoids, such as *Cymbopogon pospischilii* (= *C. plurinodis*) are common here along with some species more typical of the Succulent Karoo vegetation, such as *Monechma incana* and *Searsia undulata*. The structure of the communities of this unit thus differ from those of the Anysberg Arid Proteoid Fynbos in having Proteaceae sparse, while other shrubs and small trees such as *Dodonaea angustifolia* and *Searsia undulata* are often abundant. Succulents such as *Crassula rupestris* are also often abundant. Other species abundant include *Aspalathus hystrix, Euryops rehmannii, Felicia filifolia, Hypodiscus striatus, Leucadendron pubescens, Metalasia pallida, Passerina vulgaris, Phylica lanata, Pteronia fasciculata, Rhodocoma arida* and *Thamnochortus rigidus*. Less abundant but also characteristic of this unit are: *Anthospermum aethiopicum, Anthospermum galioides, Capeochloa stricta (= Merxmuellera stricta), Centella virgata, Crassula rubricaulis, Cullumia sulcata, Ehrharta ramosa, Elytropappus rhinocerotis, Erica syngenesia, Helichrysum zeyheri, Hermannia salviifolia, Lampranthus* sp., *Leucadendron pubescens, Muraltia dispersa, Muraltia parvifolia, Oedera squarrosa, Passerina vulgaris, Pentameris macrocalycina, Phymaspermum appressum, Protea laurifolia, Ruschia* spp., *Stoebe nervigera, Thesium ericifolium* and *Zygophyllum fulvum*. At present only one rare species, *Agathosma* sp.nov. (*anysbergensis*), that is endemic to this unit is known to occur here. This unit is in a pristine condition and utilised by klipspringer, eland and gemsbok. It would probably also be utilised by Cape mountain zebra after fire should their numbers increase.

Klein Swartberg Grassy Fynbos – 2 356 ha of this unit occur on the Klein Swartberg part of the ANR&WHS. It often occurs where a large section of the Rietvlei geological formation is exposed. A higher nutrient status of the soils may account for the high graminoid component usually present in this unit. Grass species that are abundant include *Cymbopogon pospischilii* (= *C. plurinodis*), *Ehrharta capensis*, *Ehrharta ramosa*, *Capeochloa arundinacea* (= *Merxmuellera arundinacea*), *Capeochloa stricta (= Merxmuellera stricta)*, *Pentameris distichophylla*, *Pentameris macrocalycina*, *Pentameris eriostoma* (= *Pentaschistis eriostoma*), *Pentameris malouinensis* (= *Pentaschistis malouinensis*) and *Pentameris pallida* (= *Pentaschistis pallida*). The rarity of non-sprouting Proteaceae (only a few *Leucadendron*

pubescens) and occasional abundance of *Leucadendron salignum* may be due to frequent fires in the past, but it may also be due to strong competitive interactions from the graminoid component. Other shrubs (*e.g. Aspalathus rubens*, *Erica plukenetii*, *Erica discolour* subsp. *speciosa, Pelargonium fruticosum, Struthiola argentea*) are not abundant, but Restios (*e.g. Hypodiscus striatus, Rhodocoma fruticosa, Thamnochortus rigidus*, *etc.*) are not uncommon. *Acmadenia argillophila* is the only rare species known from this unit. No alien plants have been recorded from this unit and it is in a good condition, although some of it has been exposed to grazing by domestic stock in the past. It is utilised by klipspringer, eland and gemsbok. It would also provide high quality habitat for Cape mountain zebra according to Vlok and Coetzee (2008), should the population size increase significantly.

Anysberg Renosterveld - This unit (1 024 ha) is restricted to the southern foot of the Anysberg Mountain, a zone where fires periodically sweep from the mountain onto the lower plains. It occurs on deep alluvial, often very rocky, soils and on the local silcrete plateaus. *Elytropappus rhinocerotis* is the dominant species and *Dodonaea angustifolia* is often abundant, with Fynbos elements present in the upper section near the mountain and Succulent Karoo elements present in the lower section near the river. It has *Elytropappus* more abundant, probably because fires play a more prominent role here. The silcrete outcrops that occur here harbour some rare species, such as *Acmadenia fruticosa*. A more intensive survey of this section will certainly lead to the discovery of more interesting plant species. Most of this unit is still in a healthy condition, despite the fact that it has been utilized as grazing for domestic stock in the past. No alien plant species were observed here. This unit is utilised by eland, grey rhebok and the single Cape mountain zebra mare that has recently been recorded here. Evidence of rolling sites was also observed in this unit.

Matjiesgoed Fynbos-Renosterveld – A total of 10 170 ha of this unit occur in the Kleinspreeufontein sector. The Fynbos patches are largely restricted to sites where sandy soils occur on south facing slopes, while the more abundant Renosterveld matrix occurs on the loamy soils, located on north- or south-facing slopes. The Fynbos and Renosterveld elements often merge to such a degree that it is not possible to draw a line between them. Typical of the Fynbos patches in this unit is a well develop canopy of proteoid shrubs, with *Leucadendron pubescens, Leucadendron teretifolium, Leucadendron salignum, Protea laurifolia* and/or *Protea lorifolia* present. Restioids such as *Cannomois scirpoides, Hypodiscus striatus, Restio hystrix (= Ischyrolepis hystrix)* and *Thamnochortus rigidus* are often abundant, along with ericoid shrubs such as *Erica anguliger, Erica speciosa* and *Erica syngenesia*. Other ericoid shrubs abundant and co-dominant are: *Felicia filifolia, Montinia caryophyllacea, Passerina vulgaris* and *Phylica lanata*. A rich assemblage of species of all life forms occur here, such as *Agathosma alpina, Aspalathus aemula, Aspalathus nigra, Ehrharta ramosa, Elegia filacea, Erica copiosa, Erica ostiaria, Erica rosacea, Erica selaginifolia, Leucadendron rubrum, Linum thunbergii, Oedera corymbosa, Oedera squarrosa, Pentameris macrocalycina, Phylica wittebergensis, Protea humifusa, Relhania calycina, Relhania speciosa* and *Syncarpha paniculata*. The Renosterveld matrix lack the typical proteoid component and *Elytropappus rhinocerotis* is the only dominant species, but other species abundant are *Agathosma capensis, Anthospermum spathulatum, Capeochloa stricta (= Merxmuellera stricta), Cliffortia teretifolia, Eriocephalus africanus, Felicia filifolia* and *Oedera squarrosa*. A rich assemblage of species of all life forms also occurs in the Renosterveld, such as: *Aspalathus alpestris, Clutia ericoides, Dianthus bolusii, Dimorphotheca cuneata, Drosanthemum* sp., *Muraltia parviflora,*

Polygala microlopha and *Pteronia incana*. This unit is apparently almost free from alien plant species, but certain areas have been subjected to incorrect fire regimes and grazing by domestic stock. Indicators of disturbance are a lack of non-sprouting Proteaceae in the Fynbos and often a super abundance of *Montinia caryophyllacea*. A high density of *Elytropappus rhinocerotis*, together with a lack of graminoids and a variety of other shrubs present, indicate disturbed Renosterveld communities. Rare and localized species known from this unit include *Acmadenia argillophila, Agathosma adenandriflora, Disperis purpurata, Hypodiscus sulcatus, Leucadendron cadens, Leucadendron osbornei, Lotononis comptonii* and *Quaqua linearis*. This habitat is frequented by the Cape mountain zebra present in the area, as well as red hartebeest and eland.

Vrede Fynbos-Renosterveld – 946 ha of this unit occur in the Vrede Vallei. It occurs on deep alluvial soils, which consists mostly of deep sandy soils, but small pockets of clayey soils derived from the underlying Tra-Tra geological formation also occur here. This unit is transitional and intermediate between the Fynbos, Renosterveld and the Succulent Karoo units that occur in the Anysberg area. *Elytropappus rhinocerotis* is dominant and abundant throughout this unit, but in certain small patches it is replaced by species characteristic of either the Fynbos or Succulent Karoo vegetation. In wet, often water drainage, sites Fynbos species such as *Erica quadrangularis, Leucadendron salignum* and *Rhodocoma capensis* are abundant. Species typical of the Succulent Karoo, however, replace the Renosterbos communities wherever pockets of clayey soil are exposed. Here typical Succulent Karoo species such as *Gibbaeum nuciforme, Glottiphyllum depressum* and *Pteronia paniculata* are locally dominant and abundant. This unit thus contains a highly unusual combination of species where graminoids such as *Stipagrostis obtusa* live happily next to shrubs such as *Lobostemon fruticosus* and annuals such as *Dorotheanthus bellidiformis*. Succulents are not uncommon, including an unusual ecotype of *Haworthia pumila* that represents the easternmost known distribution for this species. This unit has an unusual form of the geophyte *Cyanella hyacinthoides*, and another shrubby species that occurs along seasonal water drainage areas (*Cliffortia* cf. *neglecta*) may well also be a highly localized species endemic to this unit. A few other rare species, such as *Cliffortia semiteres, Lachenalia ameliae, Lachenalia whitehillensis*, are at present known to occur in this unit but there must be more. Much of this unit has been subjected to intensive grazing by domestic stock. Some areas have also been ploughed and developed as woodlots (mostly *Eucalyptus* species). In these disturbed sites the natural vegetation is replaced by an abundance of *Drosanthemum hispidum* and *Galenia africana*. These two species seem to collate to form a “false climax” community that is not easily replaced by later successional species. This may, in part, be due to an abundance of rodents (*e.g. Rhabdomys pumilio*) that colonize these dense swards of kraalbos. Gemsbok, red hartebeest, kudu, steenbok and duiker, as well as the horses clearly have a preference for this unit as they are are seen here on a daily basis. Although the Cape mountain zebra do not utilise this habitat at present it is highly likely that they will favour it should the population increase in size, as the habitat is rich in grass species. It is possible that they have not moved into this habitat because of competition from the horses and other game species, as well as the human activity in the area.

Vrede Karroid Renosterveld – This unit (1 613 ha) which is restricted to the Vrede Vallei occurs mostly on loamy- to clayey soils derived from the underlying Tra-Tra formation, but there are a few patches of deep sandy soils present. *Elytropappus rhinocerotis* is the dominant

species in this unit, but it is replaced by Succulent Karoo communities that are similar to those that occur in the Vrede Apronveld on clayey soils. Here the abundance of *Tylecodon wallichii* and *Cotyledon orbiculata* (both indicators of disturbance) suggests that most of this unit has been subjected to severe grazing pressure by domestic stock in the past. Rare and uncommon species recorded thus far in this unit are *Lachenalia ameliae, Lachenalia comptonii, Lachenalia whitehillensis* and *Oxalis orbicularis*. Common species recorded in this unit are: *Anisodontea triloba, Brunsvigia gregaria, Bulbine mesembryanthemoides, Carissa haematocarpa, Ceterach cordatum, Cheilanthes parviloba, Chrysanthemoides monilifera subsp. subcanescens, Colchicum coloratum* (= *Androcymbium burchellii)*, *Crassula cultrata, Crassula hemisphaerica, Crassula muscosa, Eriocephalus ericoides, Felicia filifolia, Felicia macrorrhiza, Fingerhuthia africana, Gladiolus venustus, Gloveria integrifolia, Hermannia filifolia* var. *grandicalyx, Hermannia sulcata, Hyobanche sanguinea, Melolobium exudans, Nemesia fruticosa, Nemesia ligulata, Ornithoglossum undulatum, Othonna pteronioides, Oxalis obtusa, Pentzia incana, Searsia pallens* and *Osteospermum sinuatum.* As with the Vrede Fynbos-Renosterveld, this unit is also a habitat favoured by gemsbok, red hartebeest, kudu, steenbok and duiker, as well as the horses as they are frequently seen here. Although the Cape mountain zebra do not utilise this habitat at present it is highly likely that they will favour it should the population increase in size, as the habitat is rich in grass and palatable species. It is possible that they have not moved into this habitat because of competition from the horses and other game species.

- **<u>Subtropical Thicket Biome</u>**

Anysberg Fynbos-Gwarrieveld – 216 ha occur in the Touwsfontein and Anysberg Mountain sectors. In this unit the Fynbos vegetation consists of species that occur in the Anysberg Arid Proteoid Fynbos and the Klein Swartberg Grassy Fynbos, with the graminoid component often well-developed. This unit is easily recognised by the relative abundance of *Maytenus oleoides* and *Pterocelastrus tricuspidatus* in rocky sites. Members of the Proteaceae are uncommon, with only a few *Protea laurifolia* plants present. *Agathosma ovata* is one of the most abundant small-leaved shrubs in this unit. No rare or endemic species are known from this unit. Eland, grey rhebok, gemsbok, kudu, klipspringer, duiker are often observed in this unit. Cape mountain zebra will utilise this unit, especially where water is present.

Eyerpoort Gwarrieveld – Only a small section of this unit (41 ha) occurs on the Touwsfontein sector. Gwarrie trees (*Euclea undulata*) are abundant in the matrix Succulent Karoo vegetation and heuweltjies are also common. Some patches are dominated by Scholtzbos (*Pteronia pallens*) and some quartz pebble outcrops (usually with *Pteronia flexicaulis* and succulents such as *Antegibbaeum fissoides* abundant) are present. The very rare and localised endemic *Gibbaeum nebrownii* occurs in this unit. Ostrich, eland, gemsbok and small game species have been seen in this unit.

Perdefontein Fynbos-Gwarrieveld – A very small fragment (3 ha) of this unit occurs on Grand Canyon. It consists of species typical of the Klein Swartberg Grassy Fynbos, having shrubs such as *Aspalathus hystrix* often abundant. Here, *Maytenus oleoides* is less abundant, but *Pterocelastrus tricuspidatus* and *Searsia undulata* are common in drainage lines. Some Gwarrie trees (*Euclea undulata*) are present on the lower slopes, but they are never abundant.

Members of the Proteaceae are also uncommon in the Fynbos areas, with only a few *Leucadendron salignum* plants present. No rare or endemic species are known from this unit. It is utilised by kudu, eland and small game.

Rouxpos Gwarrieveld – A large portion (2 300 ha) of this unit occurs on Grand Canyon. Woody trees (mostly *Euclea undulata, Gloveria integrifolia, Searsia undulata* and some *Pappea capensis*) and tall shrubs (*e.g. Carissa haematocarpa, Rhigozum obovatum*, *etc.*) are abundant on the north and south-facing slopes. The Succulent Karoo communities are also dominated by asteraceous shrubs (mostly *Pentzia* and *Pteronia* species) and succulents (especially *Crassula arborescens* and *Crassula rupestris*, but some *Aloe comptonii* and *Aloe microstigma* also present), but some grass (mostly *Aristida diffusa*) is also present. *Huernia praestans* is the only rare species known from this unit. This unit has been impacted previously as a result of grazing by goats and sheep. Eland, kudu, klipspringer and grey rhebok have been observed in this unit.

Spitskop Arid Gwarrieveld – 490 ha occur on Allemorgensfontein. It has Gwarrie (*Euclea undulata*) and Koeniebos (*Searsia undulata*) trees present in a matrix of Succulent Karoo communities where asteraceous shrubs and succulents such as *Aloe comptonii, Aloe microstigma, Crassula rupestris, Monechma incanum, Pelargonium alternans, Pteronia fasciculata, Tylecodon paniculata* and *Tylecodon wallichii* are present. Some Succulent Karoo communities are present on the lower slopes in which species typical of the Spitskop Apronveld occurs. No rare or localised endemic species are known from this unit, but it is suspected that some interesting geophytes may appear after good rain. This unit has been impacted historically through grazing by goats and sheep. Eland, gemsbok, springbok, red hartebeest, ostrich, steenbok and duiker utilise this unit.

Touws River Pruimveld – Of this unit a total of 3 560 ha occur on the the Allemorgensfontein and Touwsfontein sectors. This distinct unit is located along on the upper embankment of the Touws River, where the alluvial soils are deep, often sandy to loamy, with a high quartzitic rock component. Most characteristic is the abundance of woody trees with species such as *Gloveria integrifolia* and *Gymnosporia szyszylowiczii* abundant with *Euclea undulata* and occasionally *Pappea capensis*. The abundance of these trees and presence of shrubs and lianas such as *Asparagus burchellii*, *Zygophyllum morgsana*, *etc.* in the bush-clumps clearly indicate that this unit is related to the Subtropical Thicket Biome. In this unit the matrix Succulent Karoo communities are not very rich in species, with the most abundant and dominant species being *Crassula rupestris, Leipoldtia schultzei, Monechma incana, Pentzia incana, Pteronia fasciculata, Pteronia flexicaulis, Rhigozum obovatum, Thesium lineatum* and *Tylecodon wallichii*. Of interest is that the grass component is often well developed, but they are not abundant at present, probably because they were severely impacted upon when this unit was grazed by domestic stock. Other species characteristic of this unit are *Aloe comptonii, Bulbine latifolia, Carissa haematocarpa, Cotyledon orbiculata, Crassula subaphylla, Crassula deltoidea, Crassula pyramidalis, Dicoma spinosa, Digitaria argyrograpta, Ehrharta calycina, Elytropappus rhinocerotis, Felicia filifolia, Felicia muricata, Gnidia deserticola, Hereroa gracilis, Ornithogalum maculatum, Mesembryanthemum junceum, Rhodocoma arida, Ruschia* cf. *ceresiana, Mesembryanthemum tortuosum* (= *Sceletium tortuosum*) and *Selago albida*. *Tritonia securigera* subsp*. watermeyeri* and an interesting *Haworthia* species not yet identified (*H.decipiens–H.lockwoodii-H.mucronata* complex) are two uncommon species

present. Eland, gemsbok, red hartebeest, grey rhebok, springbok, steenbok, duiker and ostrich have all been recorded in this unit.

Touwsberg Fynbos-Gwarrieveld – 603 ha occur on the foot of Anysberg Mountain and on Grand Canyon. On the lower slopes the vegetation differs considerably in having trees such as *Euclea undulata, Pappea capensis* and *Searsia undulata* often abundant, along with shrubs such as *Dodonaea angustifolia, Euryops rehmannii, Helichrysum zeyheri, Monechma incana, Passerina vulgaris* and *Pteronia fasciculata*, graminoids (*e.g. Pentameris eriostoma, Rhodocoma arida*, *etc.*) and succulents (*e.g. Aloe comptonii, Cerochlamys pachyphylla, Cotyledon orbiculata, Crassula rupestris*, *etc.*). One of the succulents present, an unidentified *Conophytum* species, may well be a rare localised endemic (Steve Hammer, pers. com., 2004). Other rare species known from this unit includes *Freesia speciosa, Crotalaria lebeckioides* and an unusual single-stemmed variant of *Euphorbia pseudoglobosa*. This unit has been impacted as a result of overgrazing in the past. Eland, kudu, gemsbok, red hartebeest, steenbok, duiker and klipspringer utilise this habitat.

Vrede Arid Gwarrieveld – A total of 5 760 ha of this unit occur on the Kleinspreeufontein, Vrede Vallei and Grand Canyon sectors. It is largely restricted to arid north-facing slopes, where the usually shallow and rocky sandy to loamy soils are derived from the Wagendrift and Witpoort formations. It is similar to the Vrede Renoster-Gwarrieveld in having a sparse cover of *Euclea undulata*, but differs in *Elytropappus rhinocerotis* being uncommon. Drought tolerant shrubs and succulents (*e.g. Aloe comptonii, Braunsia apiculata, Crassula rupestris, Monechma incanum, Pelargonium alternans, Pteronia fasciculata, Sarcostemma viminale*, *etc.*) are abundant and prominent on the rocky outcrops. Most of this unit has been subjected to severe grazing pressure with palatable species such as *Cymbopogon pospischilii* (= *C. plurinodis*), *Monechma incana, Zygophyllum fulvum*, *etc.* now being uncommon. This unit is mostly free of alien plants, but a few *Opuntia ficus-indica* plants have been seen in this unit. *Quaqua linearis* and *Romulea sphaerocarpa* are two rare species known to occur in this unit. Gemsbok, red hartebeest, eland, grey rhebok, steenbok, duiker, as well as ostrich utilise this habitat. Close to Vrede the habitat is favoured by the horses, at Prinspoort by the Cape mountain zebra, and towards Grand Canyon by kudu.

Vrede Gwarrieveld – Of this unit, 5 198 ha occur on the Allemorgensfontein, Vrede Vallei and Grand Canyon sectors. It is intermediate between the Touws River Pruimveld and the Vrede Apronveld. Woody trees are still abundant in a matrix of Succulent Karoo communities, but these consist mostly of *Euclea undulata*. It is easily distinguished from the Touws River Pruimveld in that it lacks *Pappea capensis* in the woody component and *Pteronia fasciculata* as a prominent shrub in the Succulent Karoo matrix. The shrub component consists of species that are also abundant in the Vrede Apronveld, *e.g. Berkheya cuneata, Berkheya spinosa, Eriocephalus ericoides, Pteronia pallens, Tetragonia fruticosa*, *etc.* Most of this unit has been exposed to serious grazing pressure, which resulted in the invasion by *Elytropappus rhinocerotis*. On the more clayey soils the disturbed sites have been invaded by *Pteronia pallens* and *Hereroa gracilis*. In the well-rested areas the Renosterbos shrubs become senescent and are being replaced by more palatable shrubs (*e.g. Berkheya spinosa*) and grasses (*e.g. Ehrharta calycina*), a very promising sign that Gwarrieveld communities can revert back to near pristine conditions if well rested from grazing pressure. The only rare species known to be present in this unit is *Tritonia securigera* subsp*. watermeyeri*. Gemsbok,

red hartebeest, eland, kudu, springbok, steenbok, duiker, grey rhebok, Cape mountain zebra and ostrich frequent this habitat.

Vrede Renoster-Gwarrieveld – Of this unit a total of 3 462 ha occur on the Allemorgensfontein, Vrede Vallei, Kleinspreeufontein and Grand Canyon sectors. It is largely restricted to the south facing slopes where the sandy-loamy soils are derived from the Wagendrift and Karoopoort formations. A sparse woody component is present, consisting almost entirely of *Euclea undulata*. This unit differs from the Vrede Gwarrieveld mostly in having Renosterbos (*Elytropappus rhinocerotis*) the most abundant shrub, with Kapokbos (*Eriocephalus africanus*) often also abundant here. The abundance of Renosterbos is probably due to the periodic occurrence of fires, more so than through disturbance via overgrazing by domestic stock in the past. The only uncommon species known from this unit are *Gasteria brachyphylla* var. *bayeri*, *Hoodia pilifera* and *Tylecodon leucothrix*. All three these species reach about their westernmost distribution here. Eland, kudu, gemsbok, grey rhebok, Cape mountain zebra, klipspringer, steenbok and duiker favour this habitat.

- **Succulent Karoo Biome**

Allemorgens Kalkveld - This relatively small unit (892 ha) on Allemorgensfontein and a small portion also on Touwsfontein is restricted to gently undulating outcrops of calcrete, often with very shallow soils. Despite its initial barren appearance, it is very rich in species. The tree component (*Euclea undulata*) is very sparse in this arid habitat, but the vegetation consists of a rich assemblage of life forms with species such as *Aristida diffusa, Berkheya spinosa, Blepharis mitrata, Chrysocoma valida, Crassula columnaris, Dicoma fruticosa, Eriocephalus ericoides, Felicia macrorrhiza, Gazania krebsiana, Gladiolus permeabilis, Hermannia cuneifolia, Hirpicium alienatum, Jamesbrittenia atropurpurea, Limonium dregeanum, Mesembryanthemum subtruncatum, Muraltia karroica*, *Nenax microphylla, Pentzia sphaerocephala, Pteronia glauca, Pteronia pallens, Salsola verdoorniae* and *Zygophyllum lichtensteinianum* being the most abundant. Several rare species occur here, some of which may be endemic to this unit, such as *Acmadenia* sp.nov. (cf. *A. argillophila*), *Bulbine* sp.nov. (cf. *B. foleyi*), *Euphorbia* sp.nov. (cf. *E. gentilis*), *Euryops* sp.nov. (cf. *E. namaquaensis*), *Lobostemon* sp.nov. (cf. *L. fruticosus*), *Ruschia polita, Selago* sp.nov. and *Vellereophyton* sp.nov. Some unusual ecotypes are also present; such as a diminutive form of *Gibbaeum heathii*. The vegetation of this remarkable unit has been exposed to severe grazing pressure in the past, but is fortunately recovering rapidly. Gemsbok, duiker, steenbok, springbok and ostrich utilise this habitat.

Biljetsfontein Apronveld – A tiny snippet (0.07 ha) of this unit occur on Grand Canyon. The plant communities in this unit are very patchy, with a wide array of different plant growth forms locally dominant on the different soils that occur here. A wide variety of shrubs (*e.g. Berkheya cuneata, Dicoma relhanioides, Eriocephalus africanus, Felicia filifolia, Hirpicium alienatum, Monechma incanum, Pteronia flexicaulis, Pteronia paniculata, Rosenia humilis*, *etc.*) form the matrix vegetation, but some trees and tall shrubs (*Euclea undulata, Nymania capensis, Searsia undulata, etc.*) occur sporadically throughout the unit. Grasses (*e.g. Aristida diffusa, Digitaria argyrograpta, Ehrharta calycina*, *etc.*) are locally abundant in some communities, while leaf- and stem-succulents (*e.g. Anacampseros* spp*., Cheiridopsis*

namaquensis, Cephalophyllum curtophyllum, Crassula congesta, Crassula pyramidalis, Duvalia parviflora, Haworthia arachnoidea, Piaranthus parvulus, Stapelia hirsuta, Trichodiadema spp*., Tylecodon paniculata, Tylecodon wallichii*, *etc.*) are prominent in other communities. Geophytes are also abundant, some of them are rare and local endemic species, *e.g. Freesia speciosa, Syringodea saxatilis* and *Tritonia securigera* subsp*. watermeyeri*.

Dammetjies Quartz Gannaveld –This unit (347 ha) occurs on Touwsfontein, mostly in seasonal water drainage areas, where the soils are a deep loamy-clay derived from the Waboomsberg formation. A sparse layer of quartz pebbles is often exposed, which creates the favoured habitat of *Gibbaeum nuciforme*, a species that is often very abundant and characteristic of this unit. The tree component is absent and this unit usually has a sparse cover of shrubs and succulents, with *Berkheya spinosa, Mesembryanthemum subtruncatum, Mesembryanthemum junceum, Pteronia pallens, Pteronia* sp. (with tuberculate leaves and with hispid leaf margins), *Ruschia* sp., *Ruschia spinosa, Salsola tuberculata, Salsola verdoorniae* and *Zygophyllum retrofractum* the most common species. Most of this unit has been exposed to very heavy grazing pressure by domestic stock, which may account for the low species richness of this unit and the sparse vegetation. No rare species are known to occur in this unit, but *Gibbaeum nebrownii* may be present. The unidentified *Pteronia* species may also be a local endemic. The Oumansoutbos (*Atriplex nummularia*) that was planted by previous landowners is being removed. Ostrich, springbok, gemsbok, steenbok and duiker have been recorded in this habitat.

Dammetjies Randteveld – 356 ha of this unit occur on Touwsfontein. It is less arid than Touwsfontein Randteveld, and occasionally has some patches of sparse quartz pebbles present where some succulents can be found. The local hills are not very tall or steep and the vegetation has some uncommon succulents, such as *Rhinephyllum muirii*, present. The very rare *Gibbaeum nebrownii* has been reported to occur in this unit, but we have not yet located it here. Ostrich, springbok, gemsbok, red hartebeest, steenbok and duiker have been observed in this unit.

Eyerpoort Quartz Apronveld – Small but very important patches (totalling 79 ha) of this unit occur on Allemorgensfontein. In this unit many distinct patches of quartz gravels occur in the matrix Apronveld, where asteraceous shrubs typical of the Apronveld of the Touws region (*e.g.* Vrede Apronveld) are dominant and woody trees rare. The local quartz patches have many small shrubs, *e.g. Aizoon karooicum, Anthospermum comptonii, Berkheya cuneata, Berkheya* sp.nov*., Eriocephalus grandiflorus, Euryops subcarnosus, Hirpicium alienatum, Plumbago triste, Pteronia empetrifolia, Pteronia paniculata, Pteronia succulenta* and *Salsola verdoorniae* present. Succulents are also prominent, with *Gibbaeum pubescens* usually the most abundant and conspicuous succulent on the quartz patches, but many other succulent species (*e.g. Adromischus filicaulis, Antegibbaeum fissoides, Conophytum piluliforme, Conophytum truncatum, Crassula columnaris, Crassula congesta, Crassula tecta, Gibbaeum heathii, Glottiphyllum suave, Octopoma octojuge, Octopoma quadrisepala, Mesembryanthemum tortuosum* (= *Sceletium tortuosum*), *Trichodiadema densum, Zeuktophyllum calycinum*, *etc.*) are also present. Most of these small shrubs and succulents are endemic to the quartz outcrops of the western Klein Karoo. The vegetation on these quartz patches somehow seem to be more resilient to impacts of grazing by domestic stock than those of game species (especially ostrich, springbok, gemsbok). Domestic stock may have

a negative impact by establishing many footpaths, but the game species often also browse and trample these special quartz plants to the point where they are killed and then these sites are invaded by alien (*Atriplex lindleyi* subsp. *inflata*) and weedy indigenous species (*e.g. Augea capensis* and *Galenia africana*). All these weeds hold a serious threat as they have the ability to increase the sodium content of the topsoil. They alter the edaphic conditions of these highly specialized microhabitats, which can prevent the re-establishment of the original species. Ostrich, springbok and gemsbok have been observed in this unit.

Klipfontein Apronveld – This unit (542 ha in extent) occurs mainly on Kleinspreeufontein. It is largely restricted to north-facing slopes. The dominant asteraceous shrubs are sparse, while the succulent component is better developed. Characteristic of the unit is the relative abundance of leaf succulents such as *Anacampseros arachnoides, Crassula rupestris, Crassula tecta* and *Gibbaeum gibbosum.* Most of this unit has also been subjected to severe grazing pressure by domestic stock, with the palatable shrubs in this unit (*e.g. Hirpicium alienatum* and *Plumbago triste*) often being reduced to small gnarled plants. Gemsbok, red hartebeest, eland, steenbok, duiker and ostrich utilise this unit.

Klipgat Apronveld – 399 ha of this unit occur on Touwsfontein. It consists of a diverse group of often quite clearly delimited plant communities. Small patches of Scholtzbosveld (with *Pteronia pallens* prominent) and Gannaveld (with *Salsola aphylla* locally abundant) are not uncommon, but these patches are too small to map as individual units. This unit tends to occur on the higher hill tops (highlands) of the local landscape, but the local terrain must be viewed in a larger context, with the nearby upper mountains and lower river areas setting the scene. Here the matrix vegetation is still dominated by small asteraceous shrubs with species of *Eriocephalus, Felicia, Euryops, Pentzia* and *Pteronia* locally dominant, but the best way to recognize this unit is the presence and often local abundance of the local endemic leaf succulent *Gibbaeum shandii*. Tall woody trees, shrubs and grasses are rare in this unit, but some geophytes (*e.g. Eriospermum* and *Oxalis* spp.) are present. Gemsbok, springbok, red hartebeest, duiker, steenbok as well as ostrich have been observed in this habitat.

Kruisrivier Apronveld – A total of 1 133 ha of this unit occur on Allemorgensfontein. It occurs on gravelly-clayey soils derived from the shale and mudstones of the Klipbokkop and Swartruggens formations. Woody trees are rare with asteraceous shrubs (*Berkheya cuneata, Berkheya spinosa, Eriocephalus ericoides, Eriocephalus grandiflorus, Hirpicium alienatum, Pteronia empetrifolia, Pteronia paniculata, etc.*) dominant. Succulents such as *Drosanthemum* spp., *Monsonia crassicaule, Monsonia salmoniflorum, Ruschia spinosa* and *Trichodiadema* spp. are also abundant. On deeper soils *Euphorbia mauritanica* is often prominent, amongst uncommon species such as *Euphorbia pseudoglobosa*, *Euphorbia pillansii* and *Limonium amoenum*. A rich assemblage of small leafed- and stem succulents (*e.g. Antegibbaeum fissoides, Conophytum minimum, Conophytum piluliforme, Crassula tecta, Gibbaeum heathii, Glottiphyllum suave*, *etc.*) are prominent on the small quartz and terrace gravel outcrops. Some of these succulents are uncommon, such as *Rhinephyllum muirii, Gibbaeum gibbosum, Glottiphyllum fergusoniae* and *Zeuktophyllum suppositum. Lachenalia ameliae* and *Ornithogalum diluculum* are two rare geophytes that also occur here. This unit has been severely impacted in the past as a result of overgrazing, mainly by domestic stock. Ostrich, gemsbok, eland, red hartebeest, duiker, steenbok and springbok utilise this unit.

Ratelfontein Gannaveld – Of this unit, 1 591 ha occur on Allemorgensfontein and Touwsfontein. In the lower lying valleys and drainage areas the soils are a deep loamy-clay, but there are small ridges present in this unit where the soils are very shallow and mostly only consist of bare shales of the Klipbokkop and Karoopoort formations. A sparse tree component (mostly only *Vachellia karoo* (= *Acacia karroo*) and some *Schotia afra*) occurs along the water drainage areas, where Ganna (*Salsola aphylla*) is the most prominent shrub. Other common species on the deeper soils include *Berkheya spinosa, Chrysocoma ciliata, Drosanthemum* cf. *lique, Drosanthemum hispidum, Eriocephalus ericoides, Lycium cinereum, Malephora luteola, Menodora juncea, Osteospermum scariosum, Pentzia incana, Pteronia oblanceolata, Pteronia pallens, Rosenia humilis, Selago geniculata, Tetragonia fruticosa* and *Zygophyllum retrofractum*. On the ridges the shrub and tree component is sparse (only *Carissa haematocarpa* and *Euclea undulata*), with *Berkheya cuneata, Crassula arborescens, Crassula subaphylla, Cylindrophyllum tugwelliae, Dicoma spinosa, Hereroa gracilis, Osteospermum sinuatum, Plumbago triste, Pteronia flexicaulis and Mesembryanthemum tortuosum* (= *Sceletium tortuosum*) are the most abundant shrubs and succulents. Grasses are sparse, with mostly only *Aristida diffusa* present on the ridges, but this may be an artefact of previous grazing regimes as *Fingerhuthia africana* and *Cenchrus ciliaris* could be abundant in the deeper soils. The highly localized *Gibbaeum nebrownii* occur along with *Conophytum joubertii* on these small shale ridges, while the very rare and also highly localised *Gibbaeum nebrownii* occurs in some of the small quartz patches that are also present in this unit. The uncommon *Lachenalia ameliae* is the only rare species known to occur in the deep, soft soils of the Gannaveld. *Pteronia pallens* and *Hereroa gracilis* are super-abundant in sites where the vegetation has been transformed through overgrazing. Where rested, palatable species (*e.g. Berkheya cuneata, Berkheya spinosa* and *Selago geniculata*) recover rapidly. A population of riverine rabbit has been recorded in this unit near the Bloutoring road. It is also well utilised by gemsbok, red hartebeest, eland, springbok, steenbok, duiker and ostrich.

Rouxpos Randteveld – 791 ha of this unit occur on Grand Canyon. In this unit trees and tall shrubs (mostly only *Euclea undulata, Rhigozum obovatum* and *Searsia burchellii*) are more prominent on southern slopes. Succulents such as *Aloe comptonii, Crassula arborescens* and *Monsonia crassicaule* are often locally abundant, but this unit is not very rich in species. Shrubs remain sparse, but the presence of species such as Slanghoutjie (*Garuleum bipinnatum*) is quite characteristic to distinguish it from surrounding vegetation units. No rare or localized endemic species are known from this unit. This unit has been severely overgrazed in the past by domestic stock. Currently it is frequented by eland, kudu, grey rhebok, gemsbok, duiker and steenbok.

Spitskop Apronveld – This unit (2 603 ha) is restricted to Touwsfontein, where it occurs on gentle south-facing slopes in rocky, loamy soils that are often underlain by calcrete. The structure of the vegetation and the species dominant are very similar to those of the Vrede Apronveld, but a few uncommon species occur in this unit. Small succulents such as *Zeuktophyllum calycinum* are often abundant in rocky outcrops, while *Euryops* sp.nov. (*dasyphylla* ined.) seems to be endemic to the sites with deeper soils in this unit. This unit has been subjected to severe grazing by domestic stock. A section of this unit has been ploughed to plant Atriplex *nummularia*. *Pteronia pallens* has become the dominant species in these disturbed areas. Ostrich, eland, red hartebeest, springbok, gemsbok, steenbok and duiker utilise this habitat.

Spreeufontein Asbosveld - This rather restricted unit (822 ha) occurs on Kleinspreeufontein on deep, loamy alluvial soils on gentle south-facing slopes. Asbos (*Pteronia incana*) is the dominant species and few other shrub species are present, but this may be an artefact of heavy grazing in the past. *Melianthus comosus* is often prominent along watercourses in this unit. No alien plants were noted in this unit. One rare plant is known from this unit, the geophyte *Strumaria karoopoortensis*, which is otherwise only known from a single locality in the Tanqua Karoo. This unit has been overgrazed in the past. Gemsbok, eland, red hartebeest, grey rhebok, steenbok, duiker and Cape mountain zebra utilise it currently.

Spreeufontein Gannaveld – 243 ha of this unit occur on Grand Canyon. It has Ganna (*Salsola aphylla*) prominent in the drainage lines, along with other shrubs such as *Lycium cinereum* and *Melianthus comosus* and some grasses (mostly *Cenchrus ciliaris* and *Fingerhuthia africana*). Other smaller shrubs and succulents common in this unit include species such as *Berkheya spinosa, Drosanthemum giffenii, Eriocephalus ericoides, Malephora luteola, Osteospermum scariosum, Osteospermum sinuatum, Pentzia incana* and *Pteronia pallens.* Heuweltjies are rare in this Gannaveld unit. It harbours several geophytes (especially *Oxalis* spp.). The vegetation in this unit has been severely overgrazed (hammered) by goats, sheep and springbok in the past. It would probably take decades to recover and hence, it is important to ensure that the game species currently in the area do not contribute to further degradation. At present gemsbok, springbok, Cape mountain zebra, steenbok, duiker and kudu have been observed in the unit.

Spreeufontein Randteveld – 795 ha of this unit occur on Kleinspreeufontein and Grand Canyon. It is closely related to the Touwsfontein Ranteveld, both in its structure and floristic component, but differs in being a slightly more arid unit with some differentiation in the species present. It also occurs on shallow clayey soils derived from the siltstone and shales of the Adolph sport group of formations, where both the tree component (mostly *Euclea undulata*) and shrubs (*e.g. Berkheya spinosa, Carissa haematocarpa, Osteospermum scariosum*, *Pteronia pallens, etc.*) are sparse. Typical is the abundance of the leaf succulents *Cylindrophyllum tugwelliae* and *Hereroa gracilis* on north facing slopes. The very rare localized endemic *Tanquana hilmarii* is restricted to shallow soils on shale ridges in this unit, which interestingly replaces the similar looking *Gibbaeum nebrownii* of the Touwsfontein Randteveld in this unit. Indeed a rather remarkable example of convergent evolution. The construction of a borehole on the property by the previous landowner has had a negative impact on part of the *Tanquana hilmarii* population. Currently the habitat is utilised by springbok, gemsbok, steenbok, duiker, Cape mountain zebra, red hartebeest and kudu.

Touws Gannaveld – This unit is 329 ha in extent on Kleinspreeufontein and the Vrede Vallei. It is directly linked to the vegetation of the Touws River floodplain and they consequently share many species. In the upper areas, where the soils are not very saline is Bietou (*Chrysanthemoides incana*) usually the dominant shrub, but in the lower more saline areas is Ganna (*Salsola aphylla*) abundant, along with a number of other distinctive shrub species such as *Atriplex vestita, Eriocephalus decussatus, Pteronia oblanceolata, Salsola glabrescens* and *Suaeda plumosa* (= *Suaeda fruticosa)*. Grasses are uncommon, but clumps of *Stipagrostis namaquensis* is occasionally present. Flushes of annuals appear after rain, but geophytes are

rare here. Heuweltjies are absent or very rare. Gemsbok, red hartebeest, eland, ostriches, springbok, steenbok and duiker frequent this habitat.

Touwsfontein Randteveld – 3 651 ha of this unit occur on Touwsfontein. It is very arid and restricted to shallow clayey soils that are derived from the shale and mudstones of the Klipbokkop formation. Here the tree and tall shrub component is very sparse with only a few gnarled *Carissa haematocarpa* and *Euclea undulata* trees present. The sparse vegetation is dominated by shrubs and succulents with *Berkheya cuneata, Berkheya spinosa, Chrysocoma ciliata, Eriocephalus ericoides, Hereroa gracilis, Osteospermum scariosum, Pentzia incana, Pteronia pallens, Salsola tuberculata, Tetragonia fruticosa* and *Zygophyllum retrofractum* the most abundant species. Other characteristic shrubs and succulents are *Crassula arborescens, Crassula subaphylla, Cylindrophyllum tugwelliae, Dicoma spinosa, Mesembryanthemum tortuosum* (= *Sceletium tortuosum*), *Plumbago triste, Pteronia flexicaulis* and *Rosenia humilis.* The only known rare plants present are *Conophytum joubertii* and the localized endemic *Gibbaeum nebrownii* that are restricted to outcrops of bare shale in this unit. It is frequented by gemsbok, kudu, eland, red hartebeest, Cape mountain zebra, steenbok, duiker and ostrich.

Touwsfontein Scholtzbosveld – Of this unit, 5 593 ha occur on Allemorgensfontein and Touwsfontein. It is restricted to flat open plains, where loamy, alluvial soils overlay calcrete. Woody trees are rare and shrubs such as *Berkheya spinosa, Eriocephalus ericoides, Pentzia incana, Mesembryanthemum junceum, Pteronia glauca, Pteronia pallens, Ruschia spinosa, Salsola tuberculata* and *Zygophyllum retrofractum* dominate the vegetation. Most of this unit was subjected to severe grazing pressure in the past, which resulted in the super-abundance of the unpalatable *Pteronia pallens*. Although not abundant, a rich assemblage of other species still occur here, including *Asparagus capensis, Blepharis mitrata, Cephalophyllum curtophyllum, Drosanthemum* cf. *lique, Eragrostis bergiana, Euclea undulata, Euphorbia rhombifolia (= Euphorbia arceuthobioides), Fingerhuthia africana, Hereroa gracilis, Hirpicium alienatum, Monsonia crassicaule, Monsonia salmoniflora, Octopoma quadrisepalum, Mesembryanthemum splendens* (= *Phyllobolus splendens*), *Pteronia staehelinoides, Rhigozum obovatum, Ruschia* cf. *rigida, Mesembryanthemum tortuosum* (= *Sceletium tortuosum*), *Stipagrostis obtusa*, *Thesium lineatum* and *Zygophyllum lichtensteinianum*. In certain sites this unit has been ploughed up to plant *Atriplex nummularia*, which still persists along with the alien *Atriplex lindleyi* subsp. *inflata* in disturbed sites. No rare or endemic species are known to be present in this unit. Ostrich, springbok, gemsbok, red hartebeest, eland, steenbok and duiker have been observed in this unit.

Vrede Apronveld – Of this unit, 5 392 ha occur on Vrede Vallei and Grand Canyon. It occurs on deep loamy to clayey alluvial soils, mostly on gentle south facing slopes. Woody trees are sparse to absent here and the unit is dominated by asteraceous shrubs, such as *Berkheya cuneata, Berkheya spinosa, Eriocephalus ericoides, Eriocephalus grandiflorus, Pteronia empetrifolia, Pteronia pallens, Pteronia paniculata, etc.* Non-asteraceous shrubs, such as *Tetragonia fruticosa, Nenax microphylla, Drosanthemum* spp., *Selago albida*, *etc.*, are not uncommon when this unit is in a healthy condition. Like most Apronveld types this unit has been severely impacted upon by grazing by domestic stock and where this has happened *Pteronia pallens* and *Hereroa gracilis* are the only two abundant species. Fortunately, when rested well some of the palatable species such as *Berkheya spinosa* seem to be able to recover rapidly. When in a pristine condition, a wide array of species and life-forms (small shrubs,

succulents and geophytes) are present in this unit. Gemsbok, eland, kudu, red hartebeest, steenbok, springbok, duiker, Cape mountain zebra, as well as the horses have been recorded in this habitat.

Vrede Randteveld – 2 157 ha of this unit occur on Allemorgensfontein. It occurs mostly on shallow clayey soils derived from the siltstone and shales of the Tra-Tra and Waboomsberg formations. It is a less arid habitat. Small trees and shrubs such as *Euclea undulata* and *Nymania capensis* are occasionally present even on north facing slopes. Some of the succulents typical of the Touwsfontein Randteveld (*e.g. Cylindrophyllum tugwelliae*) are absent or rare, but *Crassula arborescens* remains abundant on north facing slopes. The shrub component has small shrubs such as *Pteronia incana* and *Elytropappus rhinocerotis* abundant on the south-facing slopes. There seems to be nothing unique to this unit, except the combination of abundant species on the north and south slopes. In all respects a true intermediate unit, with no known rare on endemic species known to occur here. The riverine rabbit has been recorded in this unit near the Bloutoring road. Other game species that have been observed include gemsbok, eland, red hartebeest, steenbok, springbok, duiker and ostrich.

Aquatic Vegetation Units

- Brack Water

Buffels River and Floodplain – Of this unit, only 69 ha occur on the eastern end of Grand Canyon. The vegetation of the lower sections of the Buffels River and floodplain is currently very similar to those that occur in the Touws River and floodplain unit, but it probably differed significantly in the past, as many of the tributaries that originate in the Klein Swartberg would have delivered high volumes of fresh water throughout the year into the main river system. Most of this water is now diverted for agricultural use and the river banks have been altered in many places to such an extent that it is hard to reconstruct the original vegetation. This unit differs from most of the other River and floodplain units in being quite seriously infested by the alien *Sesbania punicea,* another indicator that this system carried mostly fresh water. No rare species are known from this unit, but *Cotyledon tomentosa* subsp. *ladismithiensis* occurs on some of the steep rock faces that often align this unit. The *Sesbania* that occurred on the ANR&WHS have been cleared and is regularly being followed up.

Touws River and Floodplain – A total of 2 603 ha of this unit occur on ANR&WHS. In this unit woody trees such as *Vachellia karoo* (= *Acacia karroo*), *Searsia lancea* and *Tamarix usneoides* are often abundant on the river banks, while reeds such as *Phragmites australis* and *Typha capensis* are occasionally abundant along the edges of pools and in the riverbed. Grasses are uncommon, but *Agrostis lachnantha* occurs in moist sites in the riverbed and *Stipagrostis namaquensis* often form prominent clumps higher up in the floodplain. This unit has been invaded by several alien species, including *Arundo donax, Prosopis glandulosa, Schinus molle, Tamarix chinensis* and *Tamarix ramosissima*, with *Atriplex nummularia* occasionally also present in the floodplain zone. However, within the boundaries of ANR&WHS, *Prosopis glandulosa* and *Schinus molle* have been eradicated. No rare or localized endemic species are known to occur in this unit.

- Fresh water

Anysberg Perennial Stream – 140 ha of this unit occur on ANR&WHS. This unit is quite easy to identify as water-dependant species such as *Restio paniculatus* (= *Calopsis paniculata*), *Cannomois virgata, Carpha glomerata, Cliffortia strobilifera, Erica curviflora, Erica quadrangularis, Leucadendron eucalyptifolium, Leucadendron salicifolium* and *Psoralea affinis* and other *Psoralea karooensis* species present. None of these species are abundant in any of the nearby seasonal streams. The upper seepage areas contain localized endemic species such as *Erica* sp.nov. (cf. *E. lehmannii*) and *Hesperantha malvina* that are not known from any other unit.

Based on specimens collected and observations recorded on ANR&WHS and adjacent areas, the current plant species list consists of at least 464 plant species (including subspecies and varieties). This list is by no means complete and is constantly being updated through baseline data collection, especially with the addition of the WWF-SA land.

At least 47 of these plant species are priority species or of conservation concern (Table 3.4; Raimondo *et al*. 2009). These include species listed as Critically Endangered, Endangered, Vulnerable, Near Threatened, Data Deficient, Rare and Critically Rare. Some species listed as Least Concern are included because they are habitat specialists that occur in areas sensitive to disturbance (*e.g.* such as quartz patches). Furthermore, no less than 20 undescribed species have been found on ANR&WHS over the past two decades, some of which have recently been described (*e.g. Phymaspermum aphyllum* (Ruiters *et al.* 2016), *Psoralea karooensis* (Stirton *et al.* 2012)). It is expected that more undescribed species and new records for ANR&WHS will be found, particularly in the recently acquired areas as the veld rests and recovers from historical overgrazing.

The species are being monitored by the field rangers with the assistance of CREW groups.

Table 3.4: Priority plant species recorded from the Anysberg Nature Reserve and World Heritage Site and adjacent areas.

Scientific Name	Family	Status according to Raimondo *et al.* (2009); www.sanbi.org.za	Distribution
Gibbaeum gibbosum	Aizoaceae	Least Concern	Western Klein Karoo and Matjiesfontein
Gibbaeum nebrownii	Aizoaceae	Critically Endangered (B1ab(iii,v))	Western Klein Karoo
Gibbaeum pubescens	Aizoaceae	Least Concern	Western Klein Karoo: Barrydale to Ladismith
Glottiphyllum fergusoniae	Aizoaceae	Near Threatened (B1ab(iii,v)+2ab(iii,v)	Bellair Dam to Barrydale.
Glottiphyllum suave	Aizoaceae	Near Threatened (B1ab(iii,v))	Western Klein Karoo
Octopoma octojuge	Aizoaceae	Vulnerable (B1ab(iii,v)+2ab(iii,v))	Klein Karoo: Laingsburg to Ladismith

Scientific Name	Family	Status according to Raimondo *et al.* (2009); www.sanbi.org.za	Distribution
Tanquana hilmarii	Aizoaceae	Critically Endangered (B1ab(v)+2ab(v))	Klein Karoo: south of Laingsburg
Trichodiadema burgeri	Aizoaceae	Vulnerable (D2)	Anysberg to De Rust
Ruschia polita	Aizoaceae	Vulnerable (D2)	Kalkveld. Endemic to ANR&WHS
Zeuktophyllum suppositum	Aizoaceae	Endangered (B1ab(i,ii,iii,iv,v))	Barrydale to Calitzdorp.
Strumaria karoopoortensis	Amaryllidaceae	Vulnerable (D1)	S Tanqua Karoo to Anysberg.
Aloe longistyla	Asphodelaceae	Data Deficient (Insufficient information)	Calitzdorp to Grahamstown, Graaff-Reinet, Cradock and Middelburg.
Eriocephalus grandiflorus	Asteraceae	Rare	W Karoo and Witteberg to Swartberg Mountains
Euryops sp.nov. *E. bertilii*	Asteraceae	Not listed	Kalkveld, ANR&WHS
Othonna sp.nov. *(vanillodora)*	Asteraceae	Not listed	Western Klein Karoo endemic
Phymaspermum aphyllum	Asteraceae	Not listed	Western Klein Karoo endemic
Heliophila sp.nov. (aff. *H. glauca*)	Brassicaceae	Not listed	ANR&WHS
Ficinia anysbergensis	Cyperaceae	Rare	Anysberg, Rooiberg, Langeberg Mountains
Erica constantia	Ericaceae	Rare	Hex River to Klein Swartberg Mountains
Erica glandulipila	Ericaceae	Rare	Witteberg to Swartberg Mountains, Montagu
Erica inamoena	Ericaceae	Rare	Anysberg, Rooiberg, Swartberg Mountains
Erica insignis	Ericaceae	Rare	Anysberg and Groot Swartberg.
Euphorbia pseudoglobosa	Euphorbiaceae	Vulnerable (B1ab(iii,v)+2ab(iii,v)	Touwsrivier to Barrydale
Amphithalea villosa	Fabaceae	Near Threatened (B1ab(iii,iv,v))	Witteberg and Cederberg Mountains
Calobota elongata	Fabaceae	Vulnerable (D1+2)	Southern Tanqua Karoo between Ceres and Touwsrivier and Klein Karoo to Ladismith
Lotononis venosa	Fabaceae	Vulnerable (D2)	Bokkeveld Mountains and Barrydale
Psoralea karooensis	Fabaceae	Rare	Witteberg and Anysberg
Pelargonium citronellum	Geraniaceae	Rare	Ladismith and ANR&WHS
Lachenalia ameliae	Hyacinthaceae	Near Threatened (B)	Ceres to Montagu and Touwsrivier)
Freesia speciosa	Iridaceae	Vulnerable (B1ab(iii,v); C1)	Montagu to Calitzdorp
Syringodea saxatilis	Iridaceae	Vulnerable (B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v))	Ladismith

Scientific Name	Family	Status according to Raimondo *et al.* (2009); www.sanbi.org.za	Distribution
Tritonia securigera subsp. *watermeyeri*	Iridaceae	Rare	Montagu to Barrydale to Anysberg.
Muraltia bondii	Polygalaceae	Critically rare	Anysberg Mountain
Muraltia karroica	Polygalaceae	Vulnerable (B1ab(v)+2ab(v))	Klein Swartberg to Rooiberg and Anysberg Mountains
Leucadendron cadens	Proteaceae	Rare	Witteberg
Leucadendron teretifolium	Proteaceae	Near Threatened (B1ab+2ab)	Witteberg and Kleinrivier Mountains to Riversdale
Protea convexa	Proteaceae	Critically Endangered (A3c+4c)	Northern Cederberg, Witteberg, Klein Swartberg.
Cliffortia conifera	Rosaceae	Endangered (D)	Anysberg Mountain
Cliffortia semiteres	Rosaceae	Data Deficient (DD)	Anysberg, Swartberg and Klein Drakenstein Mountains
Acmadenia argillophila	Rutaceae	Near Threatened (D2)	Witteberg and Bonteberg Mountains
Acmadenia fruticosa	Rutaceae	Vulnerable (B1ab(iii,v); D1)	Klein Swartberg Mountain
Acmadenia sp.nov.	Rutaceae	Not listed	Kalkveld. Western Klein Karoo endemic
Adenandra dahlgrenii	Rutaceae	Rare	ANR&WHS
Agathosma adenandriflora	Rutaceae	Near Threatened (B1ab(ii,iii,iv,v)	Cederberg, Koue Bokkeveld, Hex River Mountains, Anysberg and Witteberg
Agathosma sp.nov. *(anysbergensis)*	Rutaceae	Rare	ANR&WHS
Diosma strumosa	Rutaceae	Endangered (A2c; B1ab(iii); D)	Barrydale
Lasiosiphon sp.nov.	Thymelaeaceae	Not listed	Kalkveld. Western Klein Karoo endemic

3.3.5.3 Invasive alien vegetation

Several species listed as invasive alien plant species have been recorded on the ANR&WHS. These are listed in Table 3.5. *Sesbania punicea, Eucalyptus* spp. and *Tamarix ramosissima* are the dominant alien invasive plant species on the ANR&WHS.

Table 3.5: Invasive alien plant species on the Anysberg Nature Reserve and World Heritage Site and adjacent areas.

Scientific name	Vernacular name	Family	Status (Henderson 2001)	Distribution
Acacia cyclops	Red eye/Rooikrans	Fabaceae	Declared invader	Fisantekloof, Kleinspreeufontein sector

Scientific name	Vernacular name	Family	Status (Henderson 2001)	Distribution
Agave americana	Sisal/Garingboom	Agavaceae	Declared invaders	Grand Canyon and Vrede Vallei sectors
Arundo donax	Giant reed (Spaansriet)	Poaceae	Declared weed	Along river systems
Atriplex lindleyi subsp. *inflata*	Sponge fruit saltbush/Blasiebrak	Chenopodiaceae	Declared invader	Areas where Succulent Karoo and floodplains veg have been disturbed.
Atriplex nummularia	Saltbush/ Oumansoutbos	Chenopodiaceae	Declared invader	Allemorgensfontein, Touwsfontein and Grand Canyon sectors
Atriplex semibaccata	Creeping saltbush/ Kruipsoutbos	Chenopodiaceae	Declared weed	Disturbed areas in Succulent Karoo
Callistemon rigidus	Bottlebrush/Nieu-Seelandse perdestert	Myrtaceae	Declared invader	Vrede office & accommodation
Cirsium vulgare	Scottish thistle/Skotse dissel	Asteraceae	Declared weed	Along river systems
Datura sp. (stramonium)	Thorn apple/Olieboom	Solanaceae	Declared weed	Along river systems
Echinopsis spachiana	Torch cactus/Orrelkaktus	Cactaceae	Declared weed	Grand Canyon - house
Eucalyptus camaldulensis	Red river gum / Rooibloekom	Myrtaceae	Declared invader	Touwsfontein and Vrede Vallei sectors
Eucalyptus cladocalyx	Sugar gum / Suikerbloekom	Myrtaceae	Declared invader	Touwsfontein and Vrede Vallei sectors
Eucalyptus diversicolor	Karri/Bloekom	Myrtaceae	Declared invader	Vrede plantation
Eucalyptus spp.	Bluegum/Bloekom	Myrtaceae	Declared invader	Vrede Vallei sector
Nicotiana glauca	Wild Tobacco/Wildetabak	Solanaceae	Declared weed	Along most river systems
Opuntia spp. *ficus-indica*	Prickly pear/Turksvy	Cactaceae	Declared weeds	Boplaas, Spitskop, Kruisrivier at Allemorgensfontein and Grand Canyon sectors

Scientific name	Vernacular name	Family	Status (Henderson 2001)	Distribution
Pennisetum clandestinum	Kikuyu grass/Kikoejoegras	Poaceae	Proposed Declared invader	Vrede office complex
Populus canescens	Poplar/Vaalpopulier	Salicaceae	Declared invader	Fisantekloof, Kleinspreeufontein sector
Prosopis glandulosa	Honey mesquite/ Heuningprosopis	Fabaceae	Declared invader	Along river systems
Quercus sp.	Oak/Eik	Fagaceae	Declared invader	De Vlakte farm house
Ricinus communis	Castor oil plant/ Kasterolieboom	Euphorbiaceae	Declared invader	Along most river systems
Myoporum sp.	Manatoka	Myoporaceae	Declared invader	Manager house at Goedehoop
Schinus molle	Pepper tree/Peperboom	Anacardiaceae	Declared invader	Touwsfontein sector
Schinus terebinthifolius	Brazilian Pepper tree/Braziliaanse Peperboom	Anacardiaceae	Declared invader	Manager house at Goedehoop
Sesbania punicea	Red sesbania/Rooi sesbania	Fabaceae	Declared invader	Along Anysriver systems
Tamarix chinensis	Chinese tamarisks/Chinese tamarisk	Tamaricaceae	Declared weed	Along river systems
Tamarix ramosissima	Purple tamarisk/Tamarisk	Tamaricaceae	Declared weed	Along river systems
Xanthium spinosum	Spiny cocklebur/Boetebos	Asteraceae	Declared weed	Along river systems

Augea capensis (bobbejaankos, kinderpieletjies) is an indigenous species which never used to occur in the Klein Karoo, but has spread into the area from the east (Jan Vlok; pers. comm.). It tends to invade heavily overgrazed Succulent Karoo communities.

The entire ANR&WHS (excluding the Grand Canyon sector) has been subdivided into management units (or mini-compartments), using the mapping methodology developed for Working for Water (Map 8). These management units have been drawn using natural features (*e.g.* crest of mountains; ridges; rivers) or infrastructure (*e.g.* roads, boundary fences, *etc.*) as boundaries, and a limit of 20 days per contractor team required to clear the area. They are

known as NBALs (Natural, Biological Alien). All this information has been captured onto GIS for the ANR&WHS. The Grand Canyon sector still needs to be done following the same methodology.

A database, which is compatable with the GIS spatial layer, has been compiled and populated with information obtained from the manager and field rangers. This system is used for alien vegetation management planning and analysis (*e.g.* to determine the extent, density and age class of invasive alien plant species on the reserve, for comparison with previous years). It is however, essential to continuously update this database with new/recently verified information on a monthly basis during reserve monthly planning sessions (Jacobs *et al.* 2017).

An invasive alien species plan has recently been completed for the ANR&WHS addressing not only invasive alien plant species, but also invasive alien animals (CapeNature 2016a). This plan sets the following targets:

- Bringing the alien plant invasion in the ANR&WHS into maintenance stage by 2023 through systematic mechanical, chemical and manual control according to schedule implemented by the ANR&WHS Management Team;
- Preventing the introduction of new invasive species into the area through identification and monitoring of invasive pathways and avoiding the introduction of alien species in staff gardens and monitoring Cape mountain zebra feeding sites (alien seeds in feed bales);
- Detecting any new invasive plant and animal (vertebrates and invertebrates) introductions through regular surveys and respond rapidly by removing such species before they become established and form viable populations;
- Implementing a contingency plan whereby reinvasion after a fire event is addressed by controlling regrowth within six months to one year after a fire-event.

Alien vegetation is eradicated by reserve management according to priorities set during the annual integrated work planning sessions and which are included in the Integrated Annual Plan of Operations (IAPO) for ANR&WHS. Funding is obtained through the CapeNature Integrated Catchment Management (ICM) programme for implementation.

3.3.5.4 Veld Restoration and Rehabilitation

With the acquisition of additional land to Anysberg Nature Reserve that had historically been extensively farmed, CapeNature took over the management of large areas that had been overgrazed. Especially the valley area of Grand Canyon between the gate and the Prins River had been severely impacted as a result of heavy grazing by goats, sheep and game species over several decades. Most of the highly palatable species have been grazed to small stumps and there is also clear evidence of sheet erosion and donga formation. This area is close to the farm yard where the manager's house, labourer houses, farm shed and stock kraal used to be and hence, the area where the animals had been kept for extended periods.

In order to address the erosion problem a restoration project has been proposed, which entails the construction of grass fences along contours and across dongas to prevent further soil gully erosion; installing horizontal soil saver material to retain surface soils; and

constructing resource traps (holes with particular edge construction) in level and mild slope areas. This project is, however, highly dependent on the availability of funding.

3.3.6 Fire regime

Fire is a vital ecological process in fynbos ecosystems. This is one of the key principles identified in the CapeNature Veldfire management policy (CapeNature 2016b). All the species that have evolved within the fynbos biome are adapted to periodic fires as part of their life cycles – as a matter of fact, without fire they would not be able to persist. Fires are essential to stimulate recruitment (regeneration) and maintain species richness.

Other key principles highlighted in the policy (CapeNature 2016b) include: that fire management is an integral component of programmes aimed at the reduction and control of invasive alien plant speices; that the extent of ecologically undesirable or otherwise potentially damaging wildfires must be minimised; that an adaptive management approach to integrated fire management is to be implemented; and that relevant fire management legislation must be complied with.

Fire management is therefore an important function that the conservation manager needs to perform. Management involves varying the season, frequency, intensity and size of fires, and reconciling ecological and practical requirements. According to the CapeNature fire management guideline (CapeNature 2016c), fire management practices (such as regular prescribed burning, adaptive intervention management, and natural burning zones) can be collapsed into a single model that simply varies with regard to the degree to which intervention (in the form of prescribed burning, or fire suppression and containment) is practiced. Fire management should be adapted more to the circumstances a protected area finds itself in than the eco-zone (according to Van Wilgen and Forsyth (2008)) in which it is situated.

Within the ANR&WHS all the Fynbos habitat types, as well as the Subtropical Thicket units that form a mosaic with Fynbos (listed and described in Section 3.3.5.2 above), are dependent on periodic fires to persist. The local fire regime (*i.e.* the intervals between successive fires, season of fires, intensity and fire size) plays a significant role in the species composition of the fire dependent habitat units (Esler *et al.* 2014).

Fires that have occurred on the ANR&WHS since 1983 are indicated on Map 9. As can be seen on the map, there have been few fires recorded over this period. Only small sections on the Anysberg Mountain have burnt twice since 1983, with a return interval of 27 years. Except for the fire in 2016 that was started by a farmer outside ANR&WHS and which got out of hand and burnt a large part of the Elandskloof Mountains, fires resulting from human-induced causes (*e.g.* arson, negligence) are virtually non-existing. Fortunately, the majority of the area with burnable vegetation is located in areas where there is very little threat of damage to infrastructure (except for fences). Furthermore, because of the arid climate of the Klein Karoo the fire return interval is long, probably around 27-40 years.

A natural fire zone management approach is therefore being implemented on ANR&WHS. Fires that are caused through natural ignitions (*e.g.* lightning strikes, rock falls, *etc.*) are left to burn until they burn out or are extinguished as a result of rainfall. However, if the fire threatens infrastructure or threatens to burn across the reserve boundary onto neighbouring

property, every reasonable effort will be made to contain it. In the unlikely event of a fire occurring in or threatening very young veld within ANR&WHS, steps will be taken to extinguish or contain such a fire.

Permanent *Protea* Plot data are being collected to determine the minimum fire return interval for the ANR&WHS. In addition, post-fire monitoring data are collected within 12-18 months following a fire to determine the effect of the fire on Proteaceae seedling recruitment. These data will be used to set thresholds of potential concern (TPCs) for fire return interval and season of burn (Jacobs *et al.* 2017).

In terms of fire management and in order to comply with the Natural Veld and Forest Fire Act, 1998 (Act 101 of 1998), ANR&WHS maintains firebreaks in accordance with the firebreak register. There are areas where firebreaks are not really necessary as the veld is not burnable (*e.g.* the lowland areas where the vegetation consists mainly of Succulent Karoo). In these areas agreements need to be signed with neighbouring landowners to not prepare firebreaks. Where the vegetation is burnable, it is recommended that agreements be concluded to move the firebreaks to a position in the landscape where it is practical to fight a fire from (*e.g.* existing roads). This would significantly reduce the costs of maintaining the firebreaks for both parties.

ANR&WHS falls within the Southern Cape Fire Protection Association (Charl Wade; pers. comm.), but there is no fire management unit in place yet. This is a point that will be taken forward with neighbouring landowners.

3.3.7 Fauna

3.3.7.1 Mammalian fauna

According to the CapeNature State of Biodiversity (SOB) Database a total of 68 indigenous terrestrial mammal species have been recorded for the ANR&WHS, based on specimen and observation records. These range from the tiny pygmy mouse (*Mus minutoides)* to the eland (*Taurotragus oryx*). In addition, a number of small antelope species such as common duiker (*Sylvicapra grimmia grimmia*), steenbok (*Raphicerus campestris)*, klipspringer (*Oreotragus oreotragus*), and grey rhebok (*Pelea capreolus*) occur on the reserve and no less than 20 species of bats, small rodents and insectivores. Various predators including the Cape leopard (*Panthera pardus*), brown hyaena (*Parahyaena brunnea*), caracal (*Caracal caracal*) and black-backed jackal (*Canis mesomelas*) are also present on the reserve and the surrounding area.

The full species list is not provided here. If required, the list is available on request from Scientific Services, Assegaaibosch Nature Reserve, Jonkershoek, Stellenbosch.

Table 3.6 lists the mammal species that are of conservation concern in the ANR&WHS, as well as the conservation status according to the International Union for Conservation of Nature and Natural Resources (IUCN) (IUCN 2011) and the Red List Assessments of 2016 (Child *et al.* 2016a). These species are all considered priority species, for which distribution data should be collected.

Table 3.6: Priority mammal species that occur on the Anysberg Nature Reserve and World Heritage Site.

Species	Common name (as per Skinner & Chimimba 2005)	IUCN Category (IUCN 2011)	Regional Red List Category	Comments / Proposed Action	References
Bunolagus monticularis	Riverine rabbit	Critically Endangered	Critically Endangered	Collect distribution and population data. Develop robust population monitoring methods.	Collins *et al*. 2016
Equus zebra zebra	Cape mountain zebra	Vulnerable	Least Concern	As identified in the BMP-s. Collect distribution and population data.	Hrabar *et al.* 2016
Panthera pardus pardus	Leopard	Near Threatened	Vulnerable	Collect distribution data. Confirmed (specimen record)	Swanepoel *et al.* 2016
Parahyaena brunnea	Brown hyaena	Near Threatened	Near Threatened	Confirmed, collect further distribution data.	Yarnell *et al.* 2016
Potamochoerus larvatus koiropotamus	Bushpig subsp. koiropotamus	Least Concern	Least Concern	Collect distribution data. Confirmed (specimen record). Listed in Game Translocation and Utilisation Policy (GTUP) for game management.	Venter *et al.* 2016
Poecilogale albinucha	African striped weasel	Least Concern	Near Threatened	Collect distribution data. Confirmed (observation record)	Child *et al.* 2016b
Rhinolophus clivosus	Geoffroy's horseshoe bat	Least Concern	Least Concern	Need to be confirmed. Falls within natural distribution range according to literature.	Jacobs *et al*. 2016
Myotis tricolor	Temminck's hairy bat	Least Concern	Least Concern	Need to be confirmed. Falls within natural distribution range according to literature.	Monadjem *et al.* 2016
Alcelaphus buselaphus	Red hartebeest	Least Concern	Least Concern	Confirmed (observation record). Collect distribution and population data. Listed in GTUP for game management.	Venter & Child 2016
Oreotragus oreotragus	Klipspringer	Least Concern	Least Concern	Confirmed (observation record). Collect distribution and population data (eco-typical species according to Red List Assessment).	Birss *et al*. 2016a

Species	Common name (as per Skinner & Chimimba 2005)	IUCN Category (IUCN 2011)	Regional Red List Category	Comments / Proposed Action	References
Pelea capreolus	Grey rhebok	Least Concern	Near Threatened	Collect distribution data. Develop robust population monitoring methods (eco-typical species according to Red List Assessment).	Taylor *et al*. 2016
Raphicerus campestris	Steenbok	Least Concern	Least Concern	Confirmed (observation record). Collect distribution and population data (eco-typical species according to Red List Assessment).	Palmer *et al*. 2016
Sylvicapra grimmia grimmia	Common duiker	Least Concern	Least Concern	Confirmed (observation record). Collect distribution and population data (eco-typical species according to Red List Assessment).	Birss *et al.* 2016b
Tragelaphus oryx	Eland	Least Concern	Least Concern	Confirmed (observation record). Collect distribution and population data. Listed in GTUP for game management.	Buijs *et al.* 2016
Tragelaphus strepsiceros	Kudu	Least Concern	Least Concern	Confirmed (observation record). Collect distribution and population data. Listed in GTUP for game management.	Parrini & Child 2016
Aonyx capensis	African clawless otter	Least Concern	Near Threatened	Confirmed (observation record). Collect distribution and population data.	Okes *et al.* 2016
Tragelaphus sylvaticus	Bushbuck	Least Concern	Least Concern	Confirmed (observation record). Collect distribution and population data (eco-typical species according to Red List Assessment).	Downs *et al.* 2016
Antidorcas marsupialis	Springbok	Least Concern	Least Concern	Confirmed (observation record). Listed in GTUP for game management.	Anderson *et al.* 2016

More information about the threatened species listed in Table 3.6 is given in the Western Cape State of Biodiversity Report (Birss & Palmer 2012; Birss 2017) and is summarised below. Justification for the inclusion of species that are currently non-threatened (i.e. listed as 'Near Threatened' or 'Least Consern') is also presented.

Critically Endangered

The riverine rabbit (*Bunolagus monticularis*) is one of South Africa's most threatened mammals. Without formal protection, the riverine rabbit, currently listed as Critically Endangered (Collins *et al.* 2016), is in grave danger of extinction. The most serious threat to its survival is the fragmentation and loss of its habitat. The habitat consists of shrublands on alluvial soils close to rivers in the Karoo region.

In 2013 the first riverine rabbit was discovered in the Kruisrivier area of ANR&WHS, which makes it the first population of this species to have been found in any formally protected area anywhere in the country (Collins & Du Toit 2016). Kruisrivier is an area that forms part of the Allemorgensfontein sector of ANR&WHS and it runs along the western boundary of the reserve. The riverine rabbit is a habitat specialist and according to Coetzee (1994) they specifically require a habitat that contains rich and deep alluvial soils in order for them to make nesting burrows. Deep alluvial soils are generally found in close proximity to a water course. These habitats also need to contain high quality forage (high in nutrients and water content) such as *Lycium* spp. and *Salsola* spp. (Skinner & Chimimba 2005). Not much is known about the riverine rabbit's distribution within ANR&WHS, but a research project by a student (Ms Zoe Woodgate) from the University of Cape Town is currently underway using camera traps to gather information and data. To date four individuals of the species have been recorded in the Ratelfontein Gannaveld and Vrede Ranteveld vegetation units as described in section 3.3.5.2 above.

According to Skinner and Chimimba (2005) the riverine rabbit ranks among the rarest and historically most interesting of the South African mammals. A recent study by Collins and Du Toit (2016) estimate that there are 157-207 mature individuals, which indicates an extremely low population size and confirms the species status of Critically Endangered under IUCN Red List criteria C2a(i). The species is an animal that is endemic to the Central Karoo (Skinner & Chimimba 2005) and according to Duthie *et al.* (1989) they are slow breeders and have only one or two off-spring per breeding season (which occurs from August-May). This coupled with the fact that overgrazing and cultivation along the riverbanks are the biggest threats to the habitat of the riverine rabbit (Duthie *et al*. 1989) are the reasons for its current IUCN status.

Vulnerable

Cape leopard (*Panthera pardus pardus*) is listed as Vulnerable regionally and Near Threatened globally (Swanepoel *et al.* 2016). Recent studies using camera traps have shown that there is a healthy population of Cape leopard on the ANR&WHS. No less than 40 individual leopards have been recorded within the study area. It must be noted however that many of the animals recorded may have home ranges which extend well beyond the ANR&WHS and the future conservation efforts around this species should focus on extension work with private landowners in the areas surrounding the ANR&WHS**.**

Cape mountain zebra (*Equus zebra zebra*) is classified as Vulnerable in the IUCN Red List and as Endangered in the Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974). This subspecies has recently been reassessed at a regional level, and has been down listed to 'Least Concern – conservation dependant' (Hrabar *et al*. 2016).

Cape mountain zebra once had a distribution southwards across the mountainous terrain of the Roggeveld Mountains, the Cederberg Mountains and up to the Amatolas in the Eastern Cape Province. As a result of hunting, habitat destruction and competition with farmers for grazing, however, they were driven to the verge of extinction. The number of individuals declined to less than 60 at the beginning of the 20th century, however the total population was estimated at approximately 5000 individuals at the end of 2016 (Birss *et al*. 2016c). These individuals were isolated in three subpopulations, which are all genetically distinct, and located in formal state protected areas: the Mountain Zebra National Park near Cradock and managed by the South African National Parks in the Eastern Cape Province, and the Kammanassie- and Gamkaberg WHSS managed by the Western Cape Nature Conservation Board in the Western Cape Province (Moodley 2002; Moodley & Harley 2005; Smith *et al*. 2008). Each of these relic populations therefore represents one third of the Cape mountain zebra gene pool.

The two smallest remnant populations of Cape mountain zebra occur in the Kammanassie and Gamkaberg WHSS. With small populations (Gamkaberg currently estimated at 42 from a founder population of six, Kammanassie estimated at 65-70 from a founder population of five), population bottlenecks can have serious genetic consequences. This can reduce genetic variation and leave populations open to the effects of inbreeding, with continuing loss of genetic diversity due to genetic drift. If left uncontrolled, inbreeding may reach levels where fitness is compromised thereby leading to extinction (Moodley 2002).

In 1994, a decision was taken to start with the process of introducing Cape mountain zebra back to the Anysberg area. In 1999, nine Cape mountain zebra (two stallions and seven mares; three of the group were foals of about eight months) were re-introduced into the Vrede Vallei. All the individuals came from the Karoo National Park (Cradock stock) near Beaufort West.

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In November 2002, five individuals (one stallion and four heavily pregnant mares) were found dead on the eastern boundary of the reserve at the Prinspoort entrance. The cause of death could not be established.

On the 16th August 2004 eight zebra from Karoo National Park were released into the reserve. They were four bachelors, two mares from one herd and two mares from other groups. The animals soon moved to the Matjiesgoed Mountains in the Kleinspreeufontein sector.

Today there are 23 confirmed individuals on ANR&WHS. Numbers are monitored opportunistically with sightings being recorded in the SOB database. Photographs are taken on an ad hoc basis and when research surveys are undertaken by students annually. These

photographs are organised in a photographic identikit register in which the different individuals are identified using the striped pattern on the hind quarters. However, aerial censuses for a total count of the population need to be carried out as well, and a recent recommendation is to carry out precise aerial censuses and to maintain a population register, informed by seasonal monitoring data. This activity is dependent on available funding.

A Biodiversity Management Plan for Species (BMP-s) for Cape mountain zebra was compiled in 2016 and published for public comment in 2016 (Birss *et al.* 2016c). The vision of the plan is: "An increasing, genetically healthy meta-population, supporting sustainable off-takes, with an increased conservation value and private sector investment in Cape mountain zebra". The plan is aimed at identifying, allocating and undertaking the required, identified actions to enable stakeholders to ensure the long-term survival of the subspecies in nature. It therefore focusses on actions and strategies to strengthen the overall population performance, distribution and genetic diversity to ensure overall population fitness and resilience of the meta-population within the natural distribution range.

Surplus Cape mountain zebra individuals are captured annually on the Mountain Zebra National Park in the Eastern Cape Province and donated to other conservation agencies or sold to private game reserves. Of the CapeNature protected areas, ANR&WHS has been identified as one of the priority sites for release of additional Cape mountain zebra. It has been recommended that a group of 20 Cape mountain zebra individuals be introduced to the Touwsfontein sector, based on suitability of the habitat, availability of good quality, fresh water and taking the future growth of the population into account (Schutte-Vlok 2015).

The reintroduction of viable Cape mountain zebra subpopulations into their formal distribution range is an essential component of realising the objectives of the Cape mountain zebra BMP-s, towards the establishment of a metapopulation. To build on the initial reintroduction of Cape mountain zebra onto ANR&WHS in 2002, some individuals from the De Hoop WHS were provided to Sanbona Wildlife Reserve in 2016 (adjacent to ANR&WHS) under formal custodianship to facilitate future geneflow and metapopulation management.

Near Threatened

The Cape clawless otter (*Aonyx capensis*) and the brown hyaena (*Parahyaena brunnea*) are of conservation concern in that they are indicative of ecosystem functioning outside of formally protected areas (Bussière & Underhill 2016). Both species were widely distributed throughout the Western Cape Province. Brown hyaena suffer from continued persecution resulting in artificially low numbers and very limited distribution, requiring monitoring and increased public awareness.

African striped weasel (*Poecilogale albinucha*) is a priority species primarily due to its documented range extension, warranting the collection of further distribution data to determine trends in the extent of its range. This particularly in light of the decline recorded in the eastern portion of its range.

Grey rhebok (*Pelea capreolus*) has been uplisted from Least Concern to Near Threatened because of declining subpopulations. The reasons for the decline are poorly understood. It has been suggested that the decline is due to increased illegal hunting and predation pressure

(Taylor *et al*. 2016). There is thus a need to develop a robust population monitoring method and implement the collection of data accordingly.

Least Concern
Black-backed jackal (*Canis mesomelas*), caracal (*Caracal caracal*) and chacma baboons (*Papio ursinus ursinus*) are not known to be threatened with extinction at an international or regional (national) scale, but their importance in the maintenance of ecosystem functioning and exhibition of local variation and adaptation, coupled with their proneness for human-wildlife conflict, warrant their consideration for conservation concern in the Western Cape Province, identifying the need for research and monitoring to ensure that all conservation- and other impacting actions are sustainable.

A study by Marine Drouilly (UCT, Ph.D. student; Predator Karoo Project) comparing the diet preferences of caracal and black-backed jackal on ANR&WHS *versus* a group of 22 neighbouring farms (totalling 160 000 ha) in the Koup Karoo has been underway since 2012. The study showed that the diet of black-backed jackal and caracal vary extensively between farmlands and protected areas. Caracal prefer eating wild prey but black-backed jackal show preference for livestock. Black-backed jackal occurring on ANR&WHS, however, feed mainly on small mammals, fruits and pods. Caracal also prey on small mammals but their numbers are fewer on ANR&WHS, due to the presence of leopard whereas on farmlands leopard are not present and therefore caracal numbers are higher. Predator-proof fences around farms seem to be ineffective, but electric fences may be a solution.

Invasive alien mammals
Only one alien invasive mammal species has been recorded within the ANR&WHS. In 2013 a feral cat (*Felis catus*) was spotted on one of the field cameras. It probably came from an adjacent farm.

Domesticated mammals
Horses (*Equus ferus cabballus*) are used for tourism and by field staff to do patrolling of certain areas. The horses are kept in the Vrede Vallei area and stay in a 3 km radius around the main office.

Goats and cattle enter onto Kleinspreeufontein and Grand Canyon from the neighbouring properties when fences are damaged by floods. These situations are managed on an ongoing basis (as mentioned in CapeNature 2016a).

3.3.7.2 Avifauna

The low-lying areas of the reserve consist predominantly of karroid type vegetation, while the mountainous areas are a combination of Fynbos and renosterbos. The bird species recorded on the reserve are typical of these vegetation types although a number of waterbirds have also been recorded. The latter species predominantly occur in the low-lying areas near the watercourses and their numbers fluctuate substantially due to the rainfall patterns of the area.

A total of 183 species of birds (Birds in Reserve Project (BIRP) 2015; South African Bird Atlas Project 2 (SABAP2) 2015) have been recorded on the reserve, 10 of which are listed as threatened (Table 3.7). The recording rates for the majority of the threatened species are low indicating the insignificance of the reserve for these species. The Southern black korhaan (*Afrotis afra*), however, has a relatively high recording rate in the western section of the reserve. This species is extremely sensitive to habitat transformation and large tracts of natural vegetation are important for the conservation of the species. In terms of bird surveys the reserve is relatively well-covered with only a few areas that have not been surveyed. However, replicate surveys are lacking and the areas with low replicates need to be targeted to improve the quality of the data for the reserve.

Table 3.7: Avifaunal species of conservation concern that occur on the Anysberg Nature Reserve and World Heritage Site.

Common name	Scientific name	South African Conservation Status (Taylor *et al*. 2015)	IUCN Conservation Status (IUCN 2013)
Black harrier	*Circus maurus*	Endangered	Vulnerable
Martial eagle	*Polemaetus bellicosus*	Endangered	Vulnerable
Southern black korhaan	*Afrotis afra*	Vulnerable	Vulnerable
Black stork	*Ciconia nigra*	Vulnerable	Least Concern
Lanner falcon	*Falco biarmicus*	Vulnerable	Least Concern
Verreaux's eagle	*Aquilla verreauxii*	Vulnerable	Least Concern
African rock pipit	*Anthus crenatus*	Near Threatened	Least Concern
Cape rockjumper	*Chaetops frenatus*	Near Threatened	Least Concern
Double-banded courser	*Rhinoptilus africanus*	Near Threatened	Least Concern
Karoo korhaan	*Eupodotis vigorsii*	Near Threatened	Least Concern

Domesticated birds

The ostrich (*Struthio camelus*) is the only domesticated bird species (Dr Richard Dean, October 2017; pers. comm.) which occurs within the ANR&WHS. Although numbers are low at present, steps are being taken to remove these animals. In May 2012, 488 ostriches were culled and removed from the reserve. Complete removal of the species is, however, very difficult to achieve because of the large size of the reserve and the fact that there are always some individual birds that are missed. Follow-up actions to deal with these stray individuals need to be identified in the ANR&WHS game management plan and implemented.

3.3.7.3 Reptiles

There are 54 reptile species recorded for the ANR&WHS. None of these are listed as threatened (Bates *et al.* 2014).

The reptile species list for the ANR&WHS is updated through baseline data collection and input from research and data are submitted to the CapeNature SOB database.

A request was recently received from Prof Rheta Hofmeyr (Department of Biodiversity and Conservation Biology, University of the Western Cape) to be on the lookout for the Boulenger's padloper or swaarweerskilpad (*Chersobius boulengeri*) which is classified as Near Threatened (Turner & De Villiers 2017). The aim is to find out where the species is still extant as there are concerns that the species may be in serious decline. Any observations of *Homopus* (padloper) and *Chersobius* species must be recorded by taking the GPS reading, photos of the specimen and counting the number of claws on the fore limb.

3.3.7.4 Amphibians

There are six amphibian species recorded for the ANR&WHS. None of these are listed as threatened (Minter *et al.* 2004; Measey 2011). The amphibian species list for the ANR&WHS is updated through baseline data collection and input from research and data is submitted to the CapeNature SOB database.

3.3.7.5 Fish

The greater Gouritz River system is home to eight currently described indigenous freshwater fish species, including three species of freshwater eels. Indigenous fishes include four smaller minnow species of the genera *Barbus* and *Pseudobarbus*, one species each of the genera *Galaxias* and *Sandelia*, a larger cyprinid (*Labeo umbratus*) and three freshwater eel species of the genus *Anguilla* (Skelton 2001). It must be noted that based on recent work by Yang *et al.* (2015) significant taxonomic changes are being proposed for the African cyprinids (redfins, barbs and yellowfishes). These are summarised by Skelton (2016) and the reviewed species names are used in this document. Recent local taxonomic research has also indicated that many of the currently described indigenous fish species of the Cape Floristic Region (CFR) consist of a number of genetically unique lineages which should be managed and conserved at species level (Swartz 2005; Skelton & Swartz 2011; Chakona *et al*. 2013). Many currently described species and undescribed lineages have very limited distribution ranges and are highly threatened (Tweddle *et al.* 2009; Chakona *et al*. 2013). All currently described species and known lineages are summarised in a review by Ellender *et al.* (2017).

A 2015 survey of the rivers of the ANR&WHS (Anys, Prins, Buffels and Touws Rivers) yielded a total of five freshwater fish species of which three are indigenous to the CFR (Jordaan & Gouws, 2015). These are the chubbyhead barb (*Enteromius anoplus*) (formerly *Barbus anoplus*; see Skelton 2016), smallscale redfin (*Pseudobarbus asper*) and the Cape kurper (*Sandelia capensis*). Only the latter two species are endemic to the CFR but all three are of conservation concern (Table 3.8; Impson *et al*. 2017). The most abundant species on ANR&WHS is the chubbyhead barb. This species is indigenous to the Western Cape, but has a wide natural distribution range which includes the Highveld of Limpopo to upland Kwazulu-Natal, Transkei and the middle and upper Orange basin (Skelton 2001). The chubbyhead barb is listed as Least Concern primarily due to its large distribution range and ability to thrive in a

wide variety of habitats (Cambray 2007). A number of historically isolated lineages exist within this species (Skelton & Swartz 2011) and thus the conservation status of Least Concern will need revision in future (Cambray 2007; Skelton & Swartz 2011). The status of the ANR&WHS population is currently unknown and therefore warrants it as a species of conservation concern.

Pseudobarbus asper also warrants being included in the list of priority species given its Endangered status and the evidence that its distribution range appears to be contracting within the greater Gouritz River system (Dr Martine Jordaan; pers. comm.). It is suggested to undertake monitoring of both the Buffels and Touws Rivers every second year to determine the status of existing viable populations of the smallscale redfin in the ANR&WHS rivers. There have been reports of sharptooth catfish (*Clarias gariepinus*) in Floriskraal Dam which poses a very high invasion risk to the Buffels River. Sharptooth catfish is implicated in having caused a massive range reduction in the smallscale redfin population in the Gamtoos system (Swartz & Impson 2007), but it co-exists in its native range with small minnows, so the effect of this species on the smallscale redfin is poorly understood. Initiating monitoring will serve to build a long-term dataset which can potentially include pre- and post-invasion population data which will be extremely useful given the lack of scientifically robust data on sharptooth catfish invasions in the CFR. By monitoring for this species, data will be obtained on the co-occurring chubbyhead barb and Cape kurper. The latter species is listed as Data Deficient as a result of unresolved taxonomic issues and the existence of a number of unique lineages.

Table 3.8: Fish species of conservation concern that occur on the Anysberg Nature Reserve and World Heritage Site.

Species	IUCN Category (IUCN 2011)	South African Red Data Book Category (Tweddle *et al*. 2009)
Pseudobarbus asper	Endangered	Vulnerable
Sandelia capensis	Data Deficient	Near Threatened
Enteromius anoplus	Least Concern	Least Concern

Invasive alien fish

Historical fish records for the reserve were limited to only two species, namely the banded tilapia (*Tilapia sparrmanii*) and Mozambique tilapia (*Oreochromis mossambicus*). Results from the survey of Jordaan and Gouws (2015) more than doubled the freshwater fish species records for the reserve as it yielded a total of five species of which two are alien to the CFR. It is interesting to note that the Mozambique tilapia (*Oreochromis mossambicus*), which was most recently detected in 1992 (SOB database) was not detected during the present survey. It is possible that they have either died out as a result of low winter temperatures or that they are only present in very low numbers and were thus not detected during the survey which mainly used fyke netting as sample method. A gill net survey in the dams where historical records exist may yield additional records for this species.

Based on 2015 fish survey of the ANR&WHS, the most abundant non-native species was banded tilapia (*Tilapia sparrmanii*) which was detected at two of the dams and at all river sites, with the exception of the Touws River site (Jordaan & Gouws 2015). This species has a wide natural distribution, ranging from the Orange River and Kwazulu-Natal south coast

northwards to the upper reaches of the southern Congo tributaries, Lake Malawi and the Zambezi system (Skelton 2001). Originally being distributed as a fodder fish for bass, this species now has an extensive extra-limital range in the CFR and occurs in parts of all four primary water management areas (Jordaan *et al.* 2012). While co-existence of native species with banded tilapia was observed at all sampling sites, they can exert pressure on native fishes due to their omnivorous feeding habits and competition for resources.

Common carp (*Cyprinus carpio*) was the only other non-native fish species detected and two sub-adults were caught at the lower sampling site on the Buffels River. This site provides ideal habitat for common carp as it prefers slow flowing or standing waters and a soft sandy substrate. The detection of two sub-adults at the inlet to a large turbid pool provided evidence of a breeding population of this species and the presence of significant numbers of carp in this section of river is likely. The natural distribution of common carp includes Central Asia to the Black Sea and the Danube in Europe (Skelton 2001). This species has been extensively translocated to many parts of the world where it has established invasive populations, including many parts of Southern Africa. Common carp was one of the first invasive species to be introduced to South Africa with the first introductions for angling purposes dating back to 1859 (Ellender *et al*. 2014). This species now has an extensive invasive range in the CFR and occurs in parts of all four primary water management areas (Jordaan *et al.* 2012). As common carp prefers slow moving turbid waters, they generally do not occur in headwater stream habitats and are more likely to be found in the lowland sections of larger rivers. Its impacts on native fishes are less than those of predatory non-native species such as trout and bass, but it can have serious ecological impacts on riverine ecosystems due to its destructive bottom feeding habits.

3.3.7.6 Invertebrates

Invertebrates are a vital component of terrestrial ecosystems and constitute more than 80% of all animal diversity, yet they are grossly under-represented in studies of African diversity. Site biodiversity estimates that do not consider invertebrates not only omit the greatest components of what they are attempting to measure, but also ignore groups that are very significant contributors to terrestrial ecosystem processes. Insects play a vital role in regulation of ecological communities through predation, as parasitoids, herbivory and especially as pollinators. Furthermore, they are a useful indicator group in assessing the health, diversity and functioning of a particular ecosystem (Dr Simon van Noort; pers. comm.). To be able to manage and conserve this critical faunal component, and to understand the role that invertebrates play in the environment, it is crucial to first determine the baseline taxonomic knowledge through biodiversity inventories and the subsequent systematic investigation of the collected material. Biodiversity inventories are thus essential to identify key areas for conservation and to monitor the effects of threats, and are considered good investments by conservationists.

Given our incomplete knowledge of the arthropod diversity in the Western Cape Province, it is very difficult to establish endemism of the group. Considering the high levels of plant endemism in the CFR (Goldblatt 1978), similar levels of insect endemism might be expected (Veldtman *et al.* 2017). Co-evolution between flowering plants and some specialist pollinators such as bees and pollinating flies (Tabanidae and Nemestrinidae) has led to endemism in the

Fynbos and Succulent Karoo biomes, and some of these species are thus restricted to relatively small areas. Several local scale studies of specific host plants and their herbivores in the CFR suggest that insect richness might be much higher than expected (*e.g.* Cicadellidae: Davies 1988a,b; gall-forming insects: Wright & Samways 1998). However, few invertebrate groups have been subject to careful surveys, and most comparisons have been qualitative and based on examinations of studies that differ substantially in their methods.

Comprehensive invertebrate species lists are essential as inventories of what occurs in the reserve, especially in terms of Red Data and endemic species, and as baseline information for long-term monitoring. To date, there have not been any major co-ordinated efforts to carry out Red List assessment of invertebrate taxa in South Africa (Samways *et al.* 2012). Nonetheless, Red Listing has been undertaken for a few specific taxa on an ad hoc basis by expert groups (Samways 2002).These include the Lepidoptera (butterflies and moths), Odonata (dragonflies and damselflies) and Arachnida (spiders – still in process). The butterflies of South Africa have been assessed according to the latest IUCN criteria (IUCN 2001) as part of the South African Butterfly Conservation Assessment (SABCA) project, and a preliminary assessment was published in 2009 (Mecenero *et al.* 2013). However, no threatened butterfly species occur on ANR&WHS.

The South African National Survey of Arachnida (SANSA) was initiated in 1997 (Dippenaar-Schoeman *et al.* 2015). It is an umbrella project that is implemented at a national level in collaboration with researchers and institutions countrywide dedicated to document and unify information on arachnids in South Africa. Although spiders constitute an abundant and successful group of invertebrates in South Africa, they are still poorly sampled in some areas. SANSA is providing essential information needed to address issues concerning the conservation and sustainable use of the arachnid fauna (Dippenaar-Schoeman *et al.* 2013; Dippenaar-Schoeman *et al.* 2015). The rationale for SANSA is primarily to gather baseline information for conservation assessments. Presently a Red listing project is underway to evaluate all the South African species (Lyle & Dippenaar-Schoeman, 2015). This project was initiated in 2013 and is planned to be completed before the end of 2017.

The invertebrate species list must be updated through baseline data collection. Additional information on the insects of the CFR can be obtained from the Iziko Museums of South Africa (www.iziko.org.za). Dr Simon van Noort of Iziko Museums is undertaking a long-term inventory survey of invertebrates in ANR&WHS. These surveys produce large amounts of material that need to be sorted, identified, mounted, labelled and databased to mobilise the associated data before it can feed into conservation management plans. Additionally many of the species are undescribed and it will take tens of years to taxonomically revise these groups and process this data. Nevertheless these surveys are critical to assess current biodiversity patterns in ANR&WHS enabling future comparative species richness assessments.

Comparison of species composition between sites in ANR&WHS will help in understanding the differentiation of habitats within the reserve from an invertebrate rather than a plant perspective. A comparison of species composition within ANR&WHS with other sites within southern Africa will also help to understand the uniqueness of ANR&WHS and its affiliations with habitats elsewhere. Monitoring of this sort is also valuable in evaluating the exposure of ANR&WHS to invasive invertebrates and how this might change over time. Lastly, this

inventory approach will be invaluable in the retrospective analysis of the effect of climate change on biodiversity. A preliminary list of species so far collected and identified for ANR&WHS is provided by Iziko Museums of South Africa. This, however, is a gross under-estimation of the invertebrate species richness conserved in Anysberg. The actual richness will comprise thousands of species, many of which are undescribed (Dr Simon van Noort; pers. comm.).

3.3.7.7 Game Management

Game species occurring on ANR&WHS include eland (*Taurotragus oryx*), gemsbok (*Oryx gazelle*), kudu (*Tragelaphus strepsiceros*), red hartebeest (*Alcelaphus buselaphus*), springbok (*Antidorcas marsupialis*), grey rhebok (*Pelea capreolus*), klipspringer (*Oreotragus oreotragus*), common duiker (*Sylvicapra grimmia*), steenbok (*Raphicerus campestris*) and the domesticated ostrich (*Struthio camelus*). Cape mountain zebra (*Equus zebra zebra*) have also been reintroduced. There are also domestic horses (*Equus ferus caballus*) on the reserve which are used for trails and patrols.

Surveys of all large mammals groups are conducted quarterly (at the end of indicated quarters as per the game register) and monthly during peak breeding season of priority species. (ANR&WHS conducts 10 surveys a year, *i.e.* the months of June, July, Aug, Sept, Oct, Nov, Dec, Jan, Feb and April).

All sightings are recorded in the SOB Database which will then be used to complete the game register of the reserve. Routes which provide the best coverage of the area are surveyed in a coordinated manner with a minimum of two to three observers including the driver. Persons involved in the monitoring must have the necessary mammal identification skills and be able to use spotting scopes and/or binoculars.

Aerial surveys were executed by the Bateleurs[1] during 2009, 2012 and 2016 using a Cessna 182 high wing plane. Transects were flown from east to west depending on the wind. There were three game counters and the pilot. The flying speed was 90-100 knots and the height was 400 feet. On each side of the plane a strip of 200 m was counted. The numbers recorded for the different game species at each survey are presented in Table 3.9 below.

Table 3.9: Data recorded of game species during aerial counts in 2009, 2012 and 2016 on Anysberg Nature Reserve and World Heritage Site.

SPECIES	YEAR		
	2009	**2012**	**2016**
Gemsbok	159	159	156
Red hartebeest	42	43	4
Eland	52	36	23
Kudu	0	0	8
Springbok	51	39	41

[1] The Bateleurs provides a free of charge aerial service to beneficiary (requesting) organsiations, providing them with an aerial perspective on environmental issues, with the objective of informing better decision-making. www.bateleurs.co.za

SPECIES	YEAR		
	2009	2012	2016
Grey rhebok	0	0	4
Ostrich	338	200	27
Common duiker	4	0	1
Steenbok	2	0	0

A decision was taken to remove all ostriches and 75 gemsbok from the reserve. High numbers of these animals occur on very sensitive habitats on the reserve. The greatest number of gemsbok was found in the Vrede Vallei, while most of the ostriches were on the Allemorgensfontein and Touwsfontein sectors.

In 2013 a professional team was contracted to capture these animals. Upon arrival it was decided to change the operation from a capture to a culling exercise, because of the limited accessibility of areas where the animals were moving around at that stage. A helicopter was used and 488 ostriches (453 adults and 35 chicks) and 75 gemsbok (38 bulls and 37 cows) were culled. Complete removal of all the ostriches remains a challenge, because of the extent of the reserve and the fact that there are always some individual birds that are missed. Follow-up actions to deal with these stray individuals need to be identified in the ANR&WHS game management plan and implemented.

Veld sensitivity for game

Vrede Vallei, Kleinspreeufontein, Touwsfontein, Allemorgensfontein and Grand Canyon sectors have large areas that are in the process of recovery from historic overgrazing. After purchase, all domestic stock were removed from the respective properties and the veld was allowed to rest. Monitoring plots initiated in the Vrede Vallei and Kleinspreeufontein sectors in the early 1990s, using *Eriocephalus ericoides* as indicator species, showed that natural recovery is possible, but is very slow and highly dependent on successive good rainfall years. Unpalatable species are slowly being replaced by palatable species. However, it is critical that these areas must be protected to avoid any over-utilisation by the current game species.

As Vrede Vallei and Kleinspreeufontein were the first areas to be purchased in the late 1980s, they have had the longest period of recovery. Certain habitat types tend to recover more rapidly than others, depending on the condition of the veld at the time of purchase. For example, Gannaveld and Quartz Gannaveld types are not likely to recover fully naturally, as the soils are fine and silty and highly vulnerable to erosion due to sparse vegetation cover, and the general lack of stones. In such areas dongas are often prevalent with individual plants remaining on pedestals. The alien species, *Atriplex lindleyi* subsp. *inflata* (blasiebrak, sponge fruit saltbush), and the indigenous *Augea capensis* (kinderpieletjies) are usually also present in such areas, and thus good indicators of degradation.

In the section describing the different fine-scale vegetation units (section 3.3.5.3 above) the game species that have been recorded in each are listed. The sensitivity of the vegetation units for grazing based on the species targeted and their availability is illustrated in Map 10.

Particularly the renosterveld, apronveld, kalkveld, gannaveld and the river and floodplain habitat types are highly to very highly targeted and thus sensitive to the impacts of grazing, and therefore need to be carefully monitored.

Given the fact that motivation for the expansion of ANR&WHS was based primarily on the added plant species diversity and supporting ecosystems, it is important that management actions must not have a negative effect on these species and systems, and therefore:

- Only species that occurred naturally in the area must be considered for reintroduction.
- The impact of the animals on the veld, including their food resource must be monitored.
- Collect information about where the animals spend most of their time foraging and keep accurate records of numbers of animals.
- Photo-monitoring sites must be established in areas around water points.
- Monitoring of numbers, age, sex, mortalities and natalities of species must be carried out according to set protocol.
- Aerial counts need to be carried out according to set protocol every three years.
- Decisions regarding harvesting/removal of game species, such as springbok, gemsbok, kudu and eland must be based on ecological considerations.
- Methods of capturing or removal of game to control numbers of species must be informed by ecological, practical and ethical consideration.
- Follow-up actions need to be identified to remove individual ostriches that have been missed during capturing/removal events.
- A detailed game management plan must be compiled for ANR&WHS during the next 3 years.

3.4 Cultural Heritage context of Anysberg Nature Reserve and World Heritage Site

There are numerous rock art, stone age tool, grave and fossil sites throughout the ANR&WHS.

The relatively late date of farming settlement of the Klein Karoo suggests that it was remote and isolated in historical times. From the 1600s, herders and hunters (agriculturists lived on the eastern coast) living along the southern shores of South Africa, were exposed to increasing contact with sailors, travelers and hunters from Europe. Some contacts were peaceful encounters; others were aggressive (Raven-Hart 1967). The first Europeans to penetrate into the Klein Karoo or “Kannaland” were the members of the trading expedition led by Ensign Isaac Schrijver in 1689 (Moodie 1960).

During a two-year site survey by Dr Reneé Rust (Rust 2000) details of approximately 50 rock art images were recorded on forms and, where possible, by tracing and photography. The sites tend to be small with fewer than 50 images per site and are located in narrow klowe, mostly on the Anysberg Mountain. Few sites have occupation deposits. The main interest has been the interpretation of the images. Human figures, predominantly male, are most commonly represented. Other images are animals, such as eland and elephants, antelope, felines and therianthropes (the mythological ability of human beings to metamorphose into

animals), as well as non-representational marks. There are clear resemblances in content and style to the rock art in the Hex River Valley, the Cederberg and the Western Cape generally. The art can be linked to shamanistic experiences in altered states of consciousness. A number of depictions can be interpreted as part of rainmaking rituals.

Rock art is in danger of disappearing due to the degree of natural weathering, water seepage, fire and the most immediate threat, that of human visitors. Often the paintings and engravings are damaged by visitors due to disrespect and lack of knowledge at sites. In addition care should be taken in fire prone areas to prevent vegetation immediately adjacent to the shelters from burning so as to minimise exposure to smoke, excessive heat and flames. To cultivate these principles, practical measures need to be followed that will be appropriate and effective in the field. Management is thus essential in conserving the rock art and evaluation of sites is required to establish control. Only the one site at Tapfontein is accessible to the public (Rust 2000).

A number of geological and palaeontological highlights have been identified within the ANR&WHS. They are all conservation-worthy, but only a few – principally several fossil sites situated close to roads and trails used by visitors – are considered to be vulnerable to disturbance at present. It should be noted that all scientifically important fossil and geological sites in the RSA are protected by the National Heritage Resources Act, 1999 (Act 25 of 1999) and may not be damaged or disturbed without a permit from the relevant heritage resources management authority (in this case Heritage Western Cape).

The scientifically most important fossil sites within the ANR&WHS include, for example:

- Dense assemblages of invertebrate trace fossils (burrows, feeding trails) within the Table Mountain Group on the slopes of the Anysberg Mountain and within Prinspoort (Silurian Skurweberg Formation, Early Devonian Rietvlei Formation). These are some of the best examples recorded from the upper Table Mountain Group;

- Moderately diverse assemblages of fossil marine shells (bivalves, brachiopods, snails *etc.*) from the Middle Devonian Tra Tra Formation (lower Bokkeveld Group) in a roadside borrow pit in the eastern part of the reserve. Elsewhere, fossils within the Tra Tra Formation are generally rare;

- Concretions containing well-articulated remains of extinct fossil fish groups (*e.g.* acanthodians or “spiny sharks”, placoderms) as well as dense concentrations of non-marine bivalve molluscs from the Middle Devonian Klipbokkop Formation (upper Bokkeveld Group) in the south-western reserve;

- Good examples of rare types of fossil invertebrate burrows from the Middle Devonian Osberg Formation (upper Bokkeveld Group) and Late Devonian Wagen Drift Formation (Witteberg Group) in the south-western reserve. Some of these ichnofossils have not been recorded elsewhere in South Africa hitherto.

These fossil sites should not be publicised among the general public or visited by ecotourism groups without adequate supervision. It should be noted that subsequent unsupervised visits are difficult to control.

Future palaeontological fieldwork on the ANR&WHS will focus on Middle Devonian fish fossils as well as recording any fossil remains within the Bokkeveld Group underlying newly acquired land parcels in the Grand Canyon sector, plus the hitherto unexplored upper Witteberg Group and Dwyka Group rocks on the north-western margins of the Kleinspreeufontein sector (Almond & Browning 2015).

3.5 Socio-economic context

The ANR&WHS falls within the Eden, Central Karoo and Cape Winelands District Municipalities and the Laingsburg, Langeberg and Kannaland Local Municipalities as per the Local Government: Municipal Demarcation Act, 1998 (Act 27 of 1998). The nearest towns to the ANR&WHS are Laingsburg, Ladismith, Montagu and Touwsrivier.

The Klein Karoo, in which the ANR&WHS lies, is defined as a semi-desert area with a unique and sensitive natural environment. It was once the home of the Khoi-San people.

Land-use of the areas surrounding ANR&WHS used to be predominantly farming, with ostrich, sheep and cattle farming forming the bulk of these activities. The Klein Karoo's climate is ideal for the production of apricots, peaches, plums, nectarines, and grapes, as well as vegetable seed. Several wine cellars produce top quality wines, port and brandy. In addition, the well-known Parmalat and Ladismith dairy products come from the Ladismith (Kannaland) area. The local communities are thus predominantly employed through agriculture.

Over the past decade, however, several properties adjacent to ANR&WHS have converted to life-style farms with a focus on tourism and/or game. In the western Klein Karoo, in particular there has been a remarkable switch from stock farming to game farming. This is evident in the cobweb of game fences that have already been and are still being erected around properties in the area. Some of the properties have joined CapeNature's stewardship programme (see section 4.2).

There are also an increasing number of hospitality establishments being established. Local people, visitors and tourists have found the Klein Karoo to be a place where you can experience the harshness and beauty of nature simultaneously. The natural environment of the area is an important drawcard for visitors (Gelderblom 2006), and the hospitality and tourism industry is highly dependent on it.

An important role and function of the municipalities is to balance the need for development with the need to conserve/protect the fauna and flora which is an important leverage within the agriculture and tourism industry. The area is very popular amongst artists, cyclists and off-road enthusiasts who come here for the unspoilt scenic beauty, peace and tranquility (Gelderblom 2006). The municipalities have a difficult task to balance the protection of the natural environment with the need to promote development, address infrastructural backlogs and the need to promote investment inflows to the area (Price-Waterhouse-Coopers 2012).

3.5.1 People and Parks

The World Summit on Sustainable Development in 2002 and the World Parks Congress in 2003 resolved that local people should be at the forefront of biodiversity conservation as they depend on natural resources for their livelihoods. The People and Parks conferences (during 2004 at Swadini in Mpumalanga and 2006 at Beaufort West in the Western Cape Province) served to consolidate commitment to these international resolutions and were instrumental in sensitizing the stakeholders on the importance of creating an enabling environment for communities to actively participate in all aspects of biodiversity conservation and protected area management (CapeNature 2009). This process is facilitated through the Protected Areas Advisory Committees (PAAC).

3.5.2 Access

The National Environment Management: Protected Areas Act, 2003 (Act 57 of 2003) advocates access to and benefits from protected areas.

There is access to ANR&WHS for environmental education purposes, depending on the availability of interns or students on the reserve who are willing to assist with related activities. These activities are done in collaboration with the Community Conservation component (CapeNature Region East), and reporting on these activities is co-ordinated by this component. Other governmental partners are encouraged to utilise ANR&WHS for outings, which are then coupled with relevant educational activities.

There are a total of 28 beds available in the different cottages and rustic accommodation units on ANR&WHS and camping facilities for 30 people. The accommodation facilities are designed to be eco-friendly, thus encouraging tourists to be aware of and to minimize their environmental impacts.

Work opportunities are created through various projects managed by CapeNature. These include the ICM projects (road, trail, fence, infrastructure and fire break maintenance). Although these projects only provide temporary work opportunities with CapeNature, they also contribute to contractor business and skills development. All other work on the infrastructure of the reserve is done by Department of Transport and Public Works through the Expanded Public Works Programme (EPWP).

3.5.3 Volunteers

Volunteers who assist with management issues on the ANR&WHS include CREW groups. The local CREW team (known as the 'Outramps') aims to visit ANR&WHS on an annual basis to collect data on rare and threatened plant species, which are submitted to the Threatened Species Programme run by the South Africa National Biodiversity Institute (SANBI). This information is also made available to CapeNature and used to inform management.

There are huge opportunities to improve the inventory status of the ANR&WHS. A suggestion has been made to consider hosting species inventory events involving citizen scientists. ANR&WHS is perfectly located to host such events through partnerships.

3.5.4 Researchers and Students

A house has been made available at Grand Canyon to accommodate students doing their internships, as well as researchers who are engaged in studies within the ANR&WHS. Trainee nature conservators are provided with opportunities and mentorship for Work Integrated Learning (WIL) in a real work setting and the ANR&WHS has a long and proud history of providing an excellent grounding for future conservation managers.

Most recent research undertaken include invertebrate studies (Dr Simon van Noort), archaeological studies (Dr Rene Rust), Cape mountain zebra research (Drs Joshan Moodley and Suzanne Schultz), bird surveys (Dr Alan Lee), brown hyaena research (Elsa Bussière) and the Karoo predator project (Marine Drouilly), research on the rufous rock-jumper (Krista Oswald), dung beetle studies (Lavhelesani Simba), Succulent Karoo vegetation monitoring (Dr Ute Schmiedel) and research on fire and vegetation (Martina Treurnicht).

Research aimed at improving management effectiveness is a high priority for ANR&WHS. New research insights are an important factor in promoting the adaptive management cycle. Especially research focussed on the restoration of degraded veld; the utilization of habitat types by the game species and the associated impacts on community structure, dynamics, and ecosystem processes; establishing the ecological carrying capacity of the veld for game species; setting thresholds of potential concern for veld utilisation by game species (especially selecting indicator species for monitoring); setting thresholds of potential concern for minimum and maximum fire return intervals for fire-driven ecosystems on ANR&WHS; effective control of certain invasive alien plant species (*e.g. Tamarix* spp.) in an arid environment; management needs of the Cape mountain zebra population; improving and adding to the existing plant and animal checklists; and, the ecological and socio-economic impact of expanding Anysberg Nature Reserve from a small (5197 ha) state forest nature reserve to a WHS of 79 629.4 ha through land acquisition, would be of great value.

Furthermore, the results of initial monitoring projects on the ANR&WHS need to be published. In particular the long term monitoring of veld improvement undertaken in the 1990s using *Eriocephalus ericoides* as an indicator needs to be written up in the primary scientific literature. It is the first study that shows veld improvement in the Succulent Karoo can occur with the removal of domestic stock.

3.6 Operational management within Anysberg Nature Reserve and World Heritage Site

3.6.1 Infrastructure

The infrastructure on the ANR&WHS is summarised in Table 3.10 and illustrated in Map 11.

3.6.1.1 Roads/Jeep Tracks

ANR&WHS only has gravel roads. The public roads that are used by tourists which traverse the Vrede Vallei sector from the east (Grand Canyon) to the west (Kruisrivier) are minor roads

and accessible only by high clearance vehicles. Maintenance of these roads is the responsibitlity of the provincial and district municipal road authorities.

The majority of the roads and tracks are in a poor state due to erosion, poor maintenance, poor road surfacing material used and very limited availability of gravel. Driving speed on the internal roads should be limited to 40 km/h and must be implemented by signage and traffic calming measures on roads subject to speeding.

During January 2014 there were major floods in the western Klein Karoo when more than 200 mm rainfall was measured in ANR&WHS. Many of the roads were severely damaged. A proposal was written for funding to fix and maintain some of the more severely damaged roads. Funding was approved from the Environmental Protection and Infrastructure Program (EPIP) to the sum of R17 500 000. The project will be running for two years until March 2019 and is being managed by MBB Consulting Engineers.

Most of the internal management roads consist of two tracks with a 'middelmannetjie' and are accessible mainly by 4x4 vehicles. Jeep tracks are exclusively used for management purposes. Due to the high risk of soil erosion the grading of jeep tracks within the ANR&WHS is not allowed. These roads are maintained by CapeNature. Regular assessments and maintenance work are conducted as part of the ICM programme. All secondary roads are prioritised during the Integrated Work Planning process and incorporated in the Annual Plan of Operations (APO).

All access points have gates which are kept closed, but not locked; only the two entrance gates at Kleinspreeufontein are locked.

3.6.1.2 Trails

ANR&WHS has only one very short day hiking trail to the waterfall in Land se Kloof. Most of the hikers make use of the existing 4x4 trails to hike.

The two-day horse trail starts at the Vrede stables and follows the Anys River, using game trails or following the dry riverbed. It connects with the jeep track 5 km before Tapfontein and follows it to the stables at Tapfontein. The return trail follows the 10 km jeeptrack behind Voorsteberg back to the Vrede stables.

ANR&WHS is a perfect destination for mountain biking. It is a popular recreational activity and there is great potential to expand this. Currently all the routes follow the existing road tracks. There has, however, been a request to investigate the possibility of opening up a single track route, following existing game tracks.

3.6.1.3 Buildings

There are numerous buildings (Table 3.10) on ANR&WHS. The staff houses and the majority of the tourism infrastructure on the ANR&WHS are situated in the Vrede Vallei close to the Vrede office complex. There are six staff houses at the staff village (known as 'Vaughanville'). At the office complex there is an information centre (which includes the manager's office), the field rangers' office, the laundry, merchandise store, petrol store, workshop and the

stables (Map 11). For visitors there are five cottages, an ablution facility, and a camp site with a fairly new ablution block.

Tapfontein bush camp is situated 14 km from the office at the southern foot of Matjiesgoedberg in the Kleinspreeufontein sector and is a remote site for people doing the horse trail, hikers, mountain bikers and 4x4 clients. Tapfontein consists of four wendy houses, a stable, braai lapa, shower and a flush toilet. The old historic farm house is dilapidated but some walls are still standing. On Kleinspreeufontein there are also the old farm house, a big store, a rondavel, garage and three old labourer cottages. At present, these are being used for management purposes only.

The Grand Canyon sector has one main house, a farm manager's house, two sheds and six labourer houses. The labourer house at the old lucerne fields on the far east of the sector is in a poor state and requires significant repair work. There is also a garage close to the house. Both the main house and the manager's house have generators.

Touwsfontein has a big house with a store which are used by Mr George Moggach. There is also a three-bedroomed house with a store complex and gym at Dammetjies, as well as a big shed on the property.

Allemorgensfontein sector consists of Kruisrivier, Boplaas and Allemorgensfontein. At Kruisrivier there are the old farm house (which is in a very poor state), three labourer cottages and two old small houses. Allemorgensfontein has a big farm house, a generator room, cash shop, store, two old labourer houses, the two railway houses and the one labourer cottage at Rietkloof 173. Boplaas has one very dilapidated house.

At Goedehoop in the Vrede Vallei there are the manager's house, a store complex and generator room. The De Valkte property in the Vrede Vallei also has a very dilapidated old farm house and store.

Maintenance and repairs of buildings and structures are prioritised and included in the schedule of Department of Transport and Public Works as well the CapeNature User-Asset Management Plan (U-AMP). Minor maintenance and repairs to buildings are identified and attended to by management.

Table 3.10: Buildings located within the Anysberg Nature Reserve and World Heritage Site.

No	Feature Name	Location (sector)	Feature Type
1	Main office block	Vrede Vallei	Office
2	Ablution block	Vrede Vallei	Ablution block
3	Stables	Vrede Vallei	Stable
4	Laundry	Vrede Vallei	Laundry
5	Staff house (Vaughanville)	Vrede Vallei	House
6	Staff house (Vaughanville)	Vrede Vallei	House
7	Staff house (Vaughanville)	Vrede Vallei	House
8	Staff house (Vaughanville)	Vrede Vallei	House
9	Staff house (Vaughanville)	Vrede Vallei	House
10	Staff house (Vaughanville)	Vrede Vallei	House
11	Generator room	Vrede Vallei	Enjin room

No	Feature Name	Location (sector)	Feature Type
12	Fuel store	Vrede Vallei	Store
13	Tourism cottage - Agama	Vrede Vallei	House
14	Tourism cottage - Gecko	Vrede Vallei	House
15	Tourism cottage - Chameleon	Vrede Vallei	House
16	Tourism cottage - Leguaan	Vrede Vallei	House
17	Tourism cottage - Seps	Vrede Vallei	House
18	Ablution block for cottages	Vrede Vallei	Ablution block
19	Old main house (De Vlakte)	Vrede Vallei	House dilapidated
20	Old school (De Vlakte)	Vrede Vallei	Store dilapidated
21	Manager's house (Goedehoop)	Vrede Vallei	House
22	Store complex (Goedehoop)	Vrede Vallei	Store
23	Stable (Goedehoop)	Vrede Vallei	Stable
24	Main house	Grand Canyon	House
25	Foreman's house	Grand Canyon	House
26	Generator room	Grand Canyon	Enjin room
27	Staff house	Grand Canyon	House
28	Staff house	Grand Canyon	House
29	Staff house	Grand Canyon	House
30	Staff house	Grand Canyon	House
31	Staff house	Grand Canyon	House
32	Main store	Grand Canyon	Store
33	Generator room	Grand Canyon	Enjin room
34	Fence store	Grand Canyon	Store
35	Main house	Kleinspreeufontein	House
36	Labourer house	Kleinspreeufontein	House dilapidated
37	Rondavel	Kleinspreeufontein	House
38	Main store	Kleinspreeufontein	Store
39	Garage	Kleinspreeufontein	Garage & store unit
40	Stables	Kleinspreeufontein	Stable
41	Wendy house (Tapfontein)	Kleinspreeufontein	Wooden house
42	Wendy house (Tapfontein)	Kleinspreeufontein	Wooden house
43	Wendy house (Tapfontein)	Kleinspreeufontein	Wooden house
44	Wendy house (Tapfontein)	Kleinspreeufontein	Wooden house
45	Stables (Tapfontein)	Kleinspreeufontein	Wooden stable
46	Shower (Tapfontein)	Kleinspreeufontein	Wooden shower
47	Toilet (Tapfontein)	Kleinspreeufontein	Toilet
48	Braai lapa (Tapfontein)	Kleinspreeufontein	Lapa
49	Old main house (Tapfontein)	Kleinspreeufontein	House dilapidated
50	Main house (Dammetjies)	Touwsfontein	House
51	Garage complex (Dammetjies)	Touwsfontein	Garage & store unit
52	Gym (Dammetjies)	Touwsfontein	House
53	Main house (Muckleneuck)	Touwsfontein	House
54	Main store (Muckleneuck)	Touwsfontein	Store
55	Old main house (Boplaas)	Allemorgensfontein	House dilapidated
56	Railway station house	Allemorgensfontein	House
57	Railway station house	Allemorgensfontein	House
58	Main farm house	Allemorgensfontein	House

No	Feature Name	Location (sector)	Feature Type
59	Main store	Allemorgensfontein	Store
60	Old cash shop	Allemorgensfontein	House
61	Labourer house	Allemorgensfontein	House
62	Labourer house	Allemorgensfontein	House
63	Old main house (Kruisrivier)	Allemorgensfontein	House dilapidated
64	Main house (Kruisrivier)	Allemorgensfontein	House
65	Labourer house (Kruisrivier)	Allemorgensfontein	House
66	Labourer house (Kruisrivier)	Allemorgensfontein	House
67	Labourer house (Kruisrivier)	Allemorgensfontein	House
68	Old farm house (Kruisrivier)	Allemorgensfontein	House dilapidated

3.6.1.4 Fences

Although the ANR&WHS contains large game, the whole reserve is not adequately fenced to keep all animals in the reserve. Sections of the existing fencing are old and deteriorating and requires replacement in certain areas. This has resulted in game including Cape mountain zebra and eland escaping the reserve and moving onto private land. Boundary fences at the Touwsfontein sector have been replaced and are intact and are being maintained by the relevant landowners. Most of the boundary fences consist of a 1.4 m jackal proof fence. In some areas (such as Klipgat), there is a 1.8 m high boundary game fence. The fence height will have to be increased to a 2.4 m game fence to keep the eland in.

Except for the recently aquired Grand Canyon sector, most of the internal fences have been removed on the ANR&WHS. Steps are being taken to remove the internal fencing by using an ICM team, but the fence between Vrede Vallei and the Grand Canyon sectors needs to stay in place until the veld on Grand Canyon has recovered significantly.

3.6.1.5 Environmental Management

There are no waste disposal sites in the ANR&WHS. All waste from ANR&WHS is separated at source and plastic, paper, tin and glass are taken to Montagu for recycling. Non-recyclable waste is disposed of at the municipal refuse site in Montagu.

Water for all the tourism cottages, staff village and office complex comes from a pipeline out of Land se Kloof. At the moment this supply of water is sufficient to support infrastructure at different sites where potable water is required, however, water saving actions need to be taken to prevent wastage. Each tourism cottage has a 2 500 litre tank to collect rain water. There are two rain water tanks at the camp ablution facility.

The water for the manager's house at Goedehoop comes out of the kloof behind the house and the water at Tapfontein bush camp is pumped from a borehole with a solar pump. At Grand Canyon water is supplied by a solar pump from a borehole behind the five cottages. The foreman's house has a separate borehole from which water is supplied. The water from these boreholes is potable. The main house is also supplied with water from a borehole, but this water is very brackish and not drinkable. Each house at Grand Canyon has a water tank to collect rainwater.

Sewerage treatment is by means of conservancy tanks, which are emptied once a year by the Ladismith Municipality. The sewerage removal is funded by the Department of Transport and Public Works.

3.6.1.6 High Sites

Currently there are four high sites on ANR&WHS for communication purposes. There are two sites that are used as radio repeater sites by CapeNature and these are situated on the Matjiesgoedberg and on the eastern side of Anysberg Mountain. Both have a radio mast and batteries with a solar panel.

At Grand Canyon the Vodacom site is situated east of the Laingsburg-Ladismith road. There are a generator, solar panels and a base station on the site. The access road to this site is a great concern as it is not being maintained well and there is an urgent need to address this issue.

In addition, there is an Eskom site on the western extent of the Klein Swartberg Mountain on Grand Canyon. Several large structures including a Sentech mast are located on the site.

CapeNature monitors the impacts at these high sites annually, and checks for the erection of any illegal structures.

3.6.1.7 Signage

Signboards are located at all major vehicle and hiking entrance points to the ANR&WHS.

4) THE PLANNING CONTEXT OF ANYSBERG NATURE RESERVE AND WORLD HERITAGE SITE

4.1 Regional and Provincial Planning of Anysberg Nature Reserve and World Heritage Site

ANR&WHS falls within the Eden, Central Karoo and the Cape Winelands District Municipalities and mainly within the Laingsburg and Langeberg Local Municipalities as per the Local Government: Municipal Demarcation Act, 1998 (Act 27 of 1998). Only a very small section of the south and eastern boundaries falls within the Kannaland Local Municipality. Four main towns occur on the periphery of the nature reserve complex, namely Ladismith (situated within Kannaland Municipality), Laingsburg and Matjiesfontein (situated within Laingsburg Municipality) and Montagu (situated within Langeberg Municipality).

Information from the local municipal plans that is of importance to ANR&WHS is presented below.

Laingsburg Municipality

The vision of the Laingsburg Municipality's Integrated Development Plan (IDP) (2012-2017) is that Laingsburg Municipality should be a desirable place to live, invest in and visit, and where all people may enjoy a sustainable quality of life. This is supported by the mission statement to create a people-centred and economically viable municipality where all have equal access to basic social services, educational and skills enhancement programmes and job and entrepreneurial opportunities. The Department of Environmental Affairs and Tourism prepared the National Biodiversity Strategy and Action Plan (NBSAP) for the conservation and sustainable use of the country's biological diversity. This plan identified five strategic objectives, outcomes and activities required for the NBSAP to achieve its goals:

1. A policy and legislative framework that allows the integration of biodiversity management objectives into the economy.
2. Ensure good governance in the biodiversity sector by enhancing institutional effectiveness and efficiency.
3. Integrated terrestrial and aquatic management to minimise the impacts of threatening processes on biodiversity, enhances ecosystem services and improve socio-economic security.
4. Enhance human well-being and development by enhancing the sustainable use of biological resources and equitable sharing of benefits.
5. Maintain key ecological processes across the landscape and seascape.

The implications for the Laingsburg Municipality regarding these five objectives are:

- Sensitive biodiversity areas should be mapped with clear and appropriate guidelines to guide their conservation.
- Manage grazing by livestock (Laingsburg Municipality's main agricultural activity) to promote biodiversity conservation.
- Avoid cultivation of river banks.
- Improved land management to rehabilitate degraded aquatic systems, *e.g.* veld restoration to decrease run-off and siltation of rivers, and increase recharge of aquifers.

According to the Laingsburg Municipalities' IDP five year final review report (2012 - 2017), 96% of the land within the municipality is in a natural state - the highest percentage for any of the municipalities in the Central Karoo District. Only 2% of the land in the municipality is reported to be in a degraded state. This is the lowest percentage for any of the municipalities in the Central Karoo District. The IDP (2012-2017) report also states that the rivers within this municipality are in a poor state (most classified as CR) implying that there are problems in the river catchments. The SDF (CNdV Africa 2012) states that the Anys, Buffels, Wilgehout and Meintjiesplaas Rivers have all been moderately modified and that special policy is required to protect them and restore them to an unmodified or natural state. It is believed that Laingsburg has quite a strong aquifer with a great deal of groundwater. However, this still needs to be verified.

The main threats to ecosystem integrity are crop farming and inappropriate grazing. There is a need for implementation of appropriate grazing systems to restore degraded veld to improve biodiversity and carrying capacity of the veld. In addition, government has given the go-ahead for shale gas development in the Karoo region. Part of the target area is situated north of ANR&WHS. There are multiple concerns about the water needed for hydraulic fracturing and the potential impact on groundwater resources. Large-scale renewable energy developments are being planned in the Karoo area. The current proposal is to erect a wind farm on the Witteberg Mountains. Apart from the direct impacts on the plants and animals at the site, the visual impact of such a development on the landscape and vistas of the greater area, including ANR&WHS, would be significant. Therefore, CapeNature needs to register as an Interested and Affected Party and provide comments on development proposals in the area.

According to the SDF (CNdV Africa 2012), ANR&WHS, Klein Swartberg (Towerkop) and Gamkaspoort Nature Reserves, and the declared Mountain Catchment Areas form part of the Core 1(a) Area. The extension of these existing formally protected areas into a continuous biodiversity corridor through stewardship agreements should be promoted. All rivers and their tributaries and the Floriskraal and Gamkaspoort Dams fall within the Core 1(b) Area. These should be protected by an ecological corridor for an interim distance of 30 m from the banks, until a final determination has been undertaken by freshwater ecologists and engineers. It is recommended that low impact tourist activities, such as wilderness trails and a proposed flood trail should be promoted in the Core spatial planning categories. Core 2 Areas include ecological support areas, such as the Grand Canyon property, which has since been purchased for conservation. Hence, a formal continuous biodiversity corridor is now established.

ANR&WHS contributes to one of the strategic objectives for the Laingsburg Municipality by way of providing skills development and employment opportunities to 90 community members (mainly youth) from the town of Laingsburg in a road upgrade and improvement project that dissects the nature reserve. This project was initiated in 2017 and will be running until March 2019.

Langeberg Municipality

ANR&WHS is situated within the far north eastern corner of the Langeberg Municipality's planning domain. The Langeberg Municipality SDF (CNdV Africa 2016) describes ANR&WHS as a Protected Conservation Area and lists it as a Core 1a category. Core 2 criteria are also

applicable to ANR&WHS as the reserve plays an important role in providing healthy river corridors and catchments.

The IDP vision for the Langeberg Municipality is to create a stable living environment and sustainable living conditions for all citizens whereas the spatial vision is to ensure that the municipality's physical attributes are sustainably exploited so as to continue to provide and enhance the livelihoods of its residents. The implications of this vision for ANR&WHS are as follows:

1. The water quality and quantity of the rivers must be improved, especially in the Breede, Touw, Keisies, Poesjenels, Houtbaais and Riviersonderend Rivers;
2. There should be no further urban development of existing or potential arable land;
3. The visual impact of buildings, *e.g.* large resorts, factories and sheds, and infrastructure, power lines, renewable energy facilities and roads should be carefully assessed.

The Langeberg SDF (CNdV Africa 2016) highlights the importance of protecting and completing the conservation linkages of the Langeberg Mountain corridor between ANR&WHS, Rooikrans and Drie Kuilen Private Nature Reserves and Matroosberg Mountain Catchment Area. The formal and informal conservation areas should continue to be extended by promoting private nature reserves through stewardship agreements and permitting resort development within the relevant guidelines as an incentive. This will promote economic growth and employment creation in the tourism sector as well as promote biodiversity conservation. A tourism plan (SDF 4) and Scenic Tourism Routes Policy (SDF 7) are listed as proposed municipal projects for the Langeberg Municipality and are most likely to incorporate tourism planning around the ANR&WHS.

The river networks form another important natural system and are largely in an acceptable state, except for the Touws, Keisie, Vink, Poesjenels, Houtbaais and the Riviersonderend Rivers. Conservation and improvement of these river systems are particularly important for Langeberg Municipality given the importance of agriculture and agri-industry in the local economy.

Most of Langeberg's agriculture is intensive, comprising vineyards, orchards and pastures, and employs large numbers of people. Together with the area's scenic appeal these resources and agricultural activities including wine-making, form the basis of the municipality's growing tourism industry.

<u>Kannaland Municipality</u>

A small portion of ANR&WHS falls within the Kannaland Municipality. According to the Kannaland Municipality IDP (Kannaland Municipality 2012) one of the objectives is to achieve well-protected and enhanced environmental assets and natural resources. Initiatives to achieve this include the promotion of ecotourism, incentive models to promote conservation farming and sustainable agriculture, exploring renewable energy resources, carbon sequestration Spekboom projects, recycling projects, support for the GCBR, support for eco-schools and promoting conservation stewardship agreements. The framework refers to the CBA map of Skowno *et al*. (2010) and includes the following strategies for the natural environment:

1. Protect areas such as corridors from undesirable land uses;
2. Discourage overgrazing and promote the eradication of alien plants;
3. Prioritize the formulation of Environmental Management Plans; and
4. Market proposed ecological corridors and implement land use control over these areas.

As far as the agricultural sector is concerned, high quality apricots, peaches, plums, nectarines and grapes are produced in the area (CNdV Africa 2013). Kannaland is also well known for the production of top wines and brandy. Furthermore, Ladismith is well known for the Parmalat and Ladismith range of dairy products that are produced. Game farming is a growing industry in the area and is replacing goat and sheep farming in certain areas.

Biosphere Reserve

ANR&WHS forms part of the core area of the GCBR which aims to implement practical efforts in three priority areas (Gouritz Cluster Biosphere Reserve 2016):

1. Flagship initiatives which include restoring degraded landscapes while creating employment, and converting alien biomass into economically viable products.

2. A suite of smaller scale urban and rural projects to catalyse ecologically sustainable livelihoods, for example to stimulate employment opportunities through the development of tourism related to our scenic beauty and unique biodiversity, and promotion of enterprises that contribute to ecological and socio-economic gains.

3. Knowledge generation and communication about innovations and practices that have a positive impact on the region's ecology and all its populations. Examples include environmental education involving schools and youth, collaboration with (inter-) national research initiatives and testing new models to finance restoration on privately owned degraded land.

4.2 Expansion of the Anysberg Nature Reserve and World Heritage Site

The expansion of protected areas in South Africa is informed by the National Protected Area Expansion Strategy (NPAES) (SANBI & DEA 2010). This strategy provides a broad national framework for protected area expansion in South Africa by identifying large areas which should be targeted for formal declaration and introduces a suite of mechanisms which could aid in achieving this.

In response to the NPAES, which calls on provinces to develop implementation plans in support of the NPAES and in support of provincial conservation efforts and priorities, CapeNature has produced a Protected Area Expansion Strategy and Implementation Plan (Maree *et al.* 2015). This addresses the formal proclamation of priority natural terrestrial habitats in the Western Cape Province as protected areas to secure biodiversity and ecosystem services for future generations. Although aligned to the concepts and goals of the NPAES, this strategy is informed by available resources and some if its spatial priorities are therefore different to those of the NPAES.

The planned expansion of the ANR&WHS is in line with both the national strategy and the CapeNature expansion strategy. ANR&WHS falls in the core of the GCBR, which aims to support a system of sustainable living landscapes that is representative of the region's biodiversity through the co-existence of all stakeholders. In the past, the expansion of the ANR&WHS has mainly been achieved through land purchase by the WWF-SA. Now, the chief mechanism is through the signing of stewardship agreements with neighbouring private landowners. The largest stewardship property bordering ANR&WHS is Sanbona Contract Nature Reserve via Eyerpoort (Map 12). The first phase of the LHSKT Stewardship Project, a partnership between the LHSKT, CapeNature and WWF-SA, identified a number of priority properties for stewardship in the Klein Karoo. Site recommendations were based on expert information on known biodiversity priority areas, with input from Succulent Karoo botanical experts, known and potential threats to biodiversity and the current conservation context. CapeNature's protected area expansion priorities were also taken into account (Desmet *et al.* 2012). Through this project, another nine stewardship agreements were concluded for properties bordering or in the vicinity of ANR&WHS. The total area covered by these agreements is 34 340 ha. Phase 2 of the project aims to continue building relationships with landowners in the area, provide support to landowners in the stewardship programme, and finalize additional negotiations begun in Phase 1. The core work area for Phase 2 is the area around ANR&WHS.

The main management issues on all of these properties are erosion control, alien vegetation management, road and fence maintenance and biodiversity crime (the poaching of game and succulent plants). The implications of expansion for the management of ANR&WHS are minor:

- Patrols through the three north-western properties, scheduled to coincide with planned management activities (*e.g.* when travelling through the properties to reach a section of ANR&WHS or when the opportunity arises). These patrols serve the combined purposes of law enforcement (anti-poaching and trespassing), opportunistic baseline data collection and opportunistic road maintenance.
- Fence maintenance on common boundaries.
- Firebreak management discussions and agreements with landowners of bordering stewardship sites.

Any projects on stewardship sites which would require the involvement of ANR&WHS staff need to be discussed and planned for during the annual Integrated Work Planning sessions (held during September). Such projects can only be implemented if approved and funding is available.

5) CONSERVATION DEVELOPMENT FRAMEWORK OF ANYSBERG NATURE RESERVE AND WORLD HERITAGE SITE

5.1 Sensitivity analysis

Sensitivity mapping of reserve biodiversity, heritage and physical environment forms is the main informant of spatial planning and decision-making in protected areas. It is intended to:

- inform all planned and ad-hoc infrastructure development *e.g.* location of management and tourism buildings and precincts, roads, trails, firebreaks;
- inform whole-reserve planning and formalisation of use and access as a Reserve Zonation Scheme; and
- support conservation management decisions and prioritisation.

The sensitivity maps allow for direct comparison of sites both within and between reserves to support CapeNature's planning at local and regional scales. The process highlights:

- sites with the highest regional conservation value;
- areas where human access or disturbance will have a negative impact on biodiversity or heritage, and specific environmental protection is required;
- areas where physical disturbance or infrastructure development will cause higher environmental impacts, and/or higher construction and on-going maintenance costs; as well as
- areas where there is significant environmental risk to infrastructure.

The method ensures that the location, nature and required mitigation for access, activities, and infrastructure development within protected areas can be guided by the best possible landscape-level biodiversity informants.

The process accommodates both expert-derived information and more objective scientific data and the decisions are defensible and based on a transparent process.

Biodiversity, heritage and physical features are rated on a standard scale of 1 to 5, where 1 represents no or minimal sensitivity and 5 indicates maximum sensitivity (See Figure 5.1). Additional features such as visual sensitivity, fire risk and transport costs can also be included. Higher scores represent areas that should be avoided for conventional access and infrastructure, or where specific mitigation would be required in order to address identified environmental sensitivity. A score of 5 typically represents areas where mitigation for conventional access or infrastructure development would be extensive, costly or impractical enough to be avoided at all costs, or features so sensitive that they represent a 'no go' area. For biodiversity features highest scores represent high priority sites where conservation management cannot be compromised.

Sensitivity maps cannot replace all site-scale investigation, but they are ideal for rapidly reviewing known environmental risks, and guiding whole-reserve planning to minimise overall negative environmental impact.

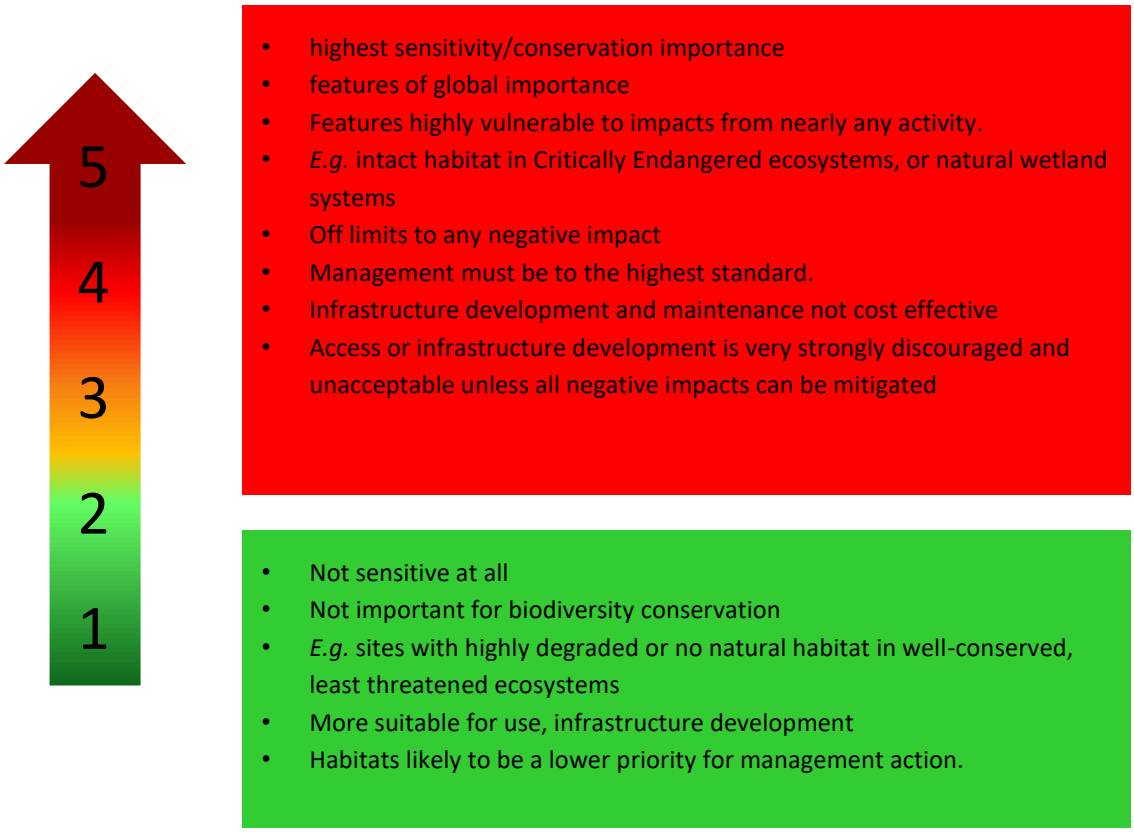


Figure 5.1: CapeNature method for sensitivity scoring and synthesis.

5.1.1 Anysberg Nature Reserve and World Heritage Site Sensitivity Analysis

Physical, biodiversity and heritage sensitivities were included in the analysis as per Table 5.1 below.

Table 5.1: Sensitivity of the Anysberg Nature Reserve and World Heritage Site based on the sensitivity of physical, biodiversity and heritage features (see Map 13).

	Category	Dataset	Criteria	Sensitivity score	
Physical	Slope (degrees) (ANYS_slope_categories1.shp)	Slope calculated from 20m resolution DEM	> 30° Effectively off-limits for infrastructure development due to extreme risk of erosion and instability, or extreme engineering mitigation and associated construction costs required.	Highest sensitivity	5
			20°-30° Strongly avoid for infrastructure development – cut and fill or other difficult and expensive construction method required. Appropriate engineering mitigation essential to prevent erosion and slope instability. Highest initial and on-going cost due to slope stabilization and erosion management required.	High sensitivity	4

	Category	Dataset	Criteria	Sensitivity score	
			10°-20° Avoid for road, trail and firebreak construction if possible. Severe erosion will develop on exposed and unprotected substrates. Pave roads and tracks, and ensure adequate drainage and erosion management is implemented. May provide good views.	Moderate sensitivity	3
			5°-10° Low topographic sensitivity, likely still suitable for built infrastructure. Use of gentle slopes may provide improved views or allow access to higher areas.	Low sensitivity	2
			0°-5° Preferred areas for any built infrastructure, lowest risk of erosion or instability, lowest construction and on-going maintenance costs.	Lowest sensitivity	1
	Soil erodibility (ANYS_veg_vlok.shp)	Reyers *et al.* (2009) based on major habitat types of Vlok *et al.* (2005).	Gannaveld and Quartz Gannaveld habitat types are the most vulnerable to soil erosion due to limited soil retention capacity, as a result of sparse vegetation cover and root systems. Soils are fine and silty and stones are generally lacking (Jan Vlok; pers. comm.).	Highest sensitivity	5
			Aquatic ecosystems (Freshwater streams & seepage areas; Rivers & floodplain) are highly sensitive to erosion, but are adapted to periodic flooding.	High sensitivity	4
			Apronveld, Mesic Proteoid Fynbos, Quartz Apronveld habitat types are more densely vegetated and/or quite stony to assist with soil retention.	Moderate sensitivity	3
			Arid Proteoid Fynbos, Grassy Fynbos, Mosaic Sandolienveld habitat types usually have dense root systems and good vegetation cover to retain soil.	Low sensitivity	2
			Arid Asteraceous, Arid Fynbos mosaics, Arid Renosterveld mosaics, Arid Succulent Karoo mosaics, Asbosveld, Kalkveld, Succulent Karoo mosaics, Ranteveld, Scholtzbosveld, Valley mosaic with Succulent Karoo habitat types generally have a good and dense perennial vegetation cover with well-developed root systems that retain soil.	Lowest sensitivity	1
Biodivers.	Rivers (ANYS_Rivers_buff 200.shp & _buff 100.shp)	1: 50 000 NGI Rivers	Within 200 m of perennial river	Highest sensitivity	5
			Within 100 m of non-perennial river	Highest sensitivity	5

	Category	Dataset	Criteria	Sensitivity score	
	Rivers and floodplains (ANYS_Rivers_ habitat.shp)	Biome habitat types from (Vlok *et al.* 2005)	DRAIN River and Source stream	Highest sensitivity	5
	Vegetation status (ANYS_veg_vlok.shp)	Conservation status of Klein Karoo vegetation units (Reyers & Vlok 2008; Skowno *et al.* 2010)	Critically Endangered	Highest sentivity	5
			Endangered	High sensitivity	4
			Vulnerable	Moderate sensitivity	3
			Least Threatened	Lowest sensitivity	1
Heritage	Archaeological & cultural sites (ANYS_ archaeol_sites_buf 25.shp)	Rust (2000) & SOB database	All known sites recorded by Rust (2000) and by reserve staff in SOB database	Highest sensitivity	5

Eventhough most of the physical characteristics of ANR&WHS (57% of slopes and 80% of the soils) are low to lowest sensitivity, and the vulnerability status of the vegetation is largely low (99% of the area scored “lowest sensitivity"), the overall sensitivity of the majority (66%) of the area is high to very high. This is due to the high to highest sensitivity of the perennial and non-perennial rivers and river habitat. In this instance therefore, the sensitivity analysis has been dominated by the drainage systems of ANR&WHS, leaving only 19% of area scored as “low or lowest sensitivity” (Table 5.2).

The sensitivity of the ANR&WHS is shown in Map 13.

Table 5.2: Summary of total and percentage area captured by the main features contributing to the sensitivity analysis illustrated in Map 13.

Feature	**Size (ha) & Percentage area (%)**	**Sensitivity score**				
		1	**2**	**3**	**4**	**5**
Slope	Area (ha)	33 163	12 246	16 523	12 307	5 390
	Area (% of total)	41.6	15.4	20.7	15.5	6.8
Soils	Area (ha)	51 420	12 132	10 786	2 795	2 495
	Area (% of total)	65	15	14	4	3
Vegetation status	Area (ha)	79 560			69	
	Area (% of total)	99.91			0.09	
River buffer (200m) - perennial	Area (ha)					36
	Area (% of total)					0.05

Feature	Size (ha) & Percentage area (%)	Sensitivity score				
		1	2	3	4	5
River buffer (100m) - non-perennial	Area (ha)					42 782
	Area (% of total)					54
River habitat	Area (ha)					2 656
	Area (% of total)					3
Archaeological sites	Area (ha)					19
	Area (% of total)					0.02
Overall score	Area (ha)	10 219	5 104	11 859	5 824	46 623
	Area (% of total)	13	6	15	7	59

The sensitivity of the vegetation units for grazing based on the species targeted and their availability is illustrated in Map 10 and the sizes and proportions in each sensitivity category are summarized in Table 5.3 below. It shows that the majority (70%) of ANR&WHS is moderately to very highly sensitive to grazing. Particularly the renosterveld, apronveld, kalkveld, gannaveld and the river and floodplain habitats are highly to very highly targeted and thus sensitive to the impacts of grazing, and therefore need to be carefully monitored.

Table 5.3: Summary of total and percentage area within the different grazing sensitivity categories illustrated in Map 10.

Feature	Size (ha) & Percentage area (%)	Sensitivity score				
		1	2	3	4	5
Grazing sensitivity	Area (ha)	9 471	14 598	22 305	19 703	13 552
	Area (% of total)	12	18	28	25	17

5.2 Zonation

Protected area zonation provides a standard framework of formal guidelines for conservation, access and use for particular areas. Zonation goes beyond natural resource protection and must also provide for:

- appropriate visitor experience;
- access and access control;
- environmental education; and
- commercial activities.

Ideally, zonation development should be done at the same time as infrastructure development planning. Good planning must aim to reduce cumulative environmental impacts and the long-term operating costs of all activities. Zonation and infrastructure development planning must be guided by:

- existing infrastructure and use;
- potential future infrastructure and access requirements; and
- careful evaluation of overall impact, construction costs and operating costs vs. likely benefits; for alternatives for every component.

Zonation requires input from all appropriate internal CapeNature stakeholders, and is a key component of the management plan which is to be evaluated during the Public Participation Process.

CapeNature's zonation categories (see Table 5.4) were developed by an internal workshop process completed in September 2010. Existing protected area zoning schemes worldwide were examined to develop a simple and powerful scheme that provides for the required range of visitor experience, access and conservation management. Particular effort was made to maintain consistency with the best developed South African zonation schemes, in particular those of South African National Parks and Ezemvelo Kwazulu-Natal Wildlife. CapeNature's zonation categories have fewer tourism-access categories, but provide more detailed and explicit guidelines with regard to zone objectives and characteristics. Furthermore, CapeNature's zonation includes new zones specifically required in the context of highly sensitive biodiversity sites and zoning of privately owned Contract Nature Reserves.

Table 5.4: Guide to CapeNature Zones on the Anysberg Nature Reserve and World Heritage Site.

Zone	Zone Objective	Characteristics	Visitor Activities	Facilities / Infrastructure	Visitor Access	Management Guidelines
Wilderness / Wilderness (declared)	***Users:*** To provide an experience of solitude in pristine landscapes with minimal evidence of human presence or use. ***Conservation:*** To limit visitor numbers and use to minimise impact. Minimal management intervention for visitor or biodiversity management. Include sensitive or threatened habitats & species in this low use zone when contiguous sites meet the criteria for wilderness.	Completely wild and rugged landscapes (or being restored to this). Areas where users have little chance of encountering any other human presence or group. Sight or sound of human activities outside zone barely discernible and at far distance; Preferably no human impact or infrastructure inside the zone other than trails. Natural burning regimes, with no active fire management and road/firebreak infrastructure. Areas with minimal Invasive Alien Plant infestations, where IAP control can be done without vehicle access. Area must meet the definition and requirements of the National Environmental Management: Protected Areas Act 57 of 2003. If formally declared in terms of the act, zone = "Wilderness (declared)"; if not = "Wilderness".	"Leave-no-trace" activities: Overnight hiking, without any sleeping facilities, formal campsites, or with only basic, un-serviced shelters. "Carry in, Carry out" principle for all food and waste. Guided or unguided nature observation. --- No fires	No infrastructure of any type if possible. No roads or vehicle tracks. No structures except small existing buildings of cultural, historic or aesthetic value. These can be used as un-serviced sleeping shelters for hikers & provided with composting toilets. Narrow permanent walking trails. No signage except small, unobtrusive markers for closed routes, or at trail junctions. **NB** – in the mountainous, slow-growing Fynbos of the Western Cape, the traditional wilderness concept of access without defined trails is unsafe and rapidly results in undesirable user-created trails and erosion.	Unguided visitor access only on foot. Visitors have freedom to use various trails. Use of donkeys, horses or other animals with an official guide only on designated historical routes and trails, or existing roads, and only where this will not cause trampling, erosion or any degradation. Limits on visitor numbers and/or control of routes and access so that zone objectives are met. Use of non-motorised canoe or flotation device on rivers can be acceptable where entry is by foot or by river from outside the zone. --- No fires No vehicle access No access without zone permit	***Visitor Management:*** Manage to conserve natural and cultural resources, ecological processes and wilderness integrity. Leave no trace ethic. Restrict numbers of visitors and allow for no-use rest periods if required. Limited management interventions. Management measures may be carried out in extreme conditions, but tread lightly principles must apply. Since visitor use cannot be intensively managed, re-route trails away from any areas with sensitive local habitats or plant and animal species. Trail layout, design and construction must reduce maintenance requirements. ***Conservation Management:*** Habitats with minimal management requirements, typically natural burning zones. Prevent or restore visible trampling or any other impact. Rehabilitate non-essential roads to natural vegetation. Re-zone essential roads out of Wilderness Zoning. ***Consumptive Use:*** Not compatible

Zone	Zone Objective	Characteristics	Visitor Activities	Facilities / Infrastructure	Visitor Access	Management Guidelines
Primitive	***Users:*** To provide an experience of solitude in natural landscapes with little nearby evidence of human presence. Can provide access to and buffer Wilderness Zones. ***Conservation:*** To limit visitor use, numbers and infrastructure to minimise impact in sensitive environments. To reduce need for management of users and visitor impacts. Allows for minimal or more intensive biodiversity management intervention. *Include extensive areas of sensitive or threatened habitats & species in this low use zone when sites do not meet the criteria for wilderness.*	Intrinsically wild appearance & character. Areas where users will seldom encounter other human groups or presence. Any visible human impact or infrastructure inside the zone is unobtrusive. Human activities outside zone may be audible or visible in places. Areas remote from management centres, or otherwise difficult or expensive to access for management. Areas that might not meet the criteria for Wilderness but can serve as undeveloped visual buffers for Wilderness. Areas that may have natural burning regimes, with no active fire management and road/firebreak infrastructure OR areas that require active fire management to stay within thresholds of concern.	Guided or unguided nature observation Primarily intended for hiking or walking access. Only allows for 4x4 routes or vehicle access if specifically considered and noted. Only allows for non-hiking accommodation node if specifically considered and noted.	Deviation from natural state to be minimised. Infrastructure should not be visible from Wilderness Zones. May provide isolated, small, unobtrusive accommodation facilities for up to 16 guests on restricted footprints, particularly for overnight hiking trails. May have defined or beaconed hiking routes, management access roads, tracks and firebreaks. All roads, tracks or trails to be located and constructed to reduce maintenance, visibility and erosion. Where un-surfaced tracks will result in erosion, use concrete strip or interlocking pavers to stabilise. Re-route unstable or erosion-prone road sections if this will lower long-term visual and environmental impact. New roads for visitor access only justified if also required for management access. Avoid wide surfaced roads or roads and tracks wider than required for a single vehicle.	Visitor access only by permit. Control of visitor numbers, frequency and group sizes to meet zone objectives. Only users of facilities/activities will access to this zone. Defined or non-defined hiking and day trail routes. On foot always. Bicycle, 2x4 or 4x4 vehicle, or horseback on designated routes only. --- No access without zone permit	***Visitor Management:*** Manage to conserve natural and cultural resources, ecological processes and wild appearance & character. Restrict numbers of visitors and allow for no-use rest periods if required. All facilities will be small, very basic, self-catering and distributed to avoid contact between users. There should be limited if any interaction between groups. Since visitor use usually cannot be intensively managed, re-route trails away from any areas with sensitive local habitats or plant and animal species. Trail layout, design and construction must reduce maintenance requirements. Visible & audible human impacts from adjacent zones should be mitigated. ***Conservation Management:*** Habitats with lower or higher management requirements. May be natural burning zones. Usually remote areas so roads and trails should be planned and constructed assuming infrequent maintenance. Prevent or restore visible trampling or any other visitor impact. Rehabilitate non-useful roads to natural vegetation. ***Consumptive Use:*** Sustainable use can be appropriate under controlled circumstances subject to a formal assessment and application in accordance with CapeNature policies.

Zone	Zone Objective	Characteristics	Visitor Activities	Facilities / Infrastructure	Visitor Access	Management Guidelines
Nature Access	***Users:*** To provide easy access to natural landscapes with low expectation of solitude at all times. Can buffer between development and wilderness or Primitive Zones. ***Conservation:*** To manage and direct visitor use, and plan infrastructure to minimise impact on sensitive environments. To actively manage users and visitor impacts. Allows for minimal or more intensive biodiversity management intervention. *Provide additional protection to localised sensitive or threatened habitats, species or other features by Special Management Overlays*	Areas with extensive lower sensitivity habitats: Areas able to accommodate higher numbers of visitors regularly, with no identified sensitive or regionally rare biodiversity. Popular view or access sites. Extensive areas able to accommodate roads, trails and tracks without high risk of erosion and degradation. Areas accessible for regular management of roads and trails. Areas where roads and trail infrastructure can be located with low visibility from the surrounding landscape, particularly from adjacent Primitive or Wilderness Zones. Usually areas that require active fire management with firebreaks to stay within thresholds of concern, but may also include natural burning regimes.	Guided or unguided nature observation. Day hiking trails and/or short trails. Bird hides, canoeing, mountain biking & rock-climbing where appropriate. Other activities if specifically considered and approved as part of specific reserve zoning scheme. Motorised 2x4 self-drive access on designated routes. No accommodation or camping. Frequent interaction with other users.	Some deviation from natural/pristine state allowed particularly on less sensitive or already disturbed/transformed sites. No accommodation; but ablution facilities may be provided. May have defined or beaconed hiking routes, tourism and management access roads, and management tracks and firebreaks. Infrastructure should be designed to reduce impacts of higher visitor numbers. Roads open to the public should be accessible by 2x4 sedan. Full width tarred or surfaced roads or roads and tracks to accommodate two vehicles are appropriate. Un-surfaced roads may be surfaced if a road planning exercise has confirmed that the location is suitable.	No special access control or permits required for this zone. Will cater for larger number of visitors than primitive zone. Vehicle access on dedicated routes, with pedestrian access from parking areas or adjacent Development Zones. On water – only non-motorised crafts allowed unless specifically noted.	***Visitor Management:*** More frequent monitoring of these areas is necessary to prevent damage or degradation. More frequent footpath maintenance must be scheduled for busy routes, with particular attention paid to use of railings or other access control to prevent damage to sensitive areas. Unless visitor access can definitely be intensively guided and managed, re-route trails away from any sensitive local habitats or plant and animal species. Trail layout, design and construction must be specified to reduce maintenance requirements under higher use. Visible & audible human impacts to adjacent Primitive or Wilderness Zones should be mitigated. ***Conservation Management:*** Habitats with lower or higher management requirements. May be natural burning zones. Prevent or restore visible trampling or any other visitor impact. Rehabilitate non-useful roads to natural vegetation. ***Consumptive Use:*** Sustainable use may be appropriate subject to a formal assessment and application in accordance with CapeNature policies.

Zone	Zone Objective	Characteristics	Visitor Activities	Facilities / Infrastructure	Visitor Access	Management Guidelines
Development – Low Intensity	***Users:*** To provide access to adjacent natural landscapes with no expectation of solitude. To provide primarily self-catering accommodation or camping. Can provide for Environmental Education accommodation and access into surrounding landscapes. ***Conservation:*** To locate the zone and infrastructure to minimise impact on sensitive environments. To actively manage users and visitor impacts on adjacent sensitive areas. *Provide additional protection to sensitive or threatened habitats, species or other features by Special Management Overlays*	Areas with existing degraded or transformed footprints. Natural or semi-natural habitats only where essential to minimise impacts over whole reserve. Areas able to accommodate high numbers of visitors regularly, with no identified sensitive or regionally rare biodiversity. Areas able to accommodate roads, trails and accommodation infrastructure without risk of erosion or degradation. Areas easily accessible from reserve management centre. Areas where risk of fire damage to infrastructure is low or can be mitigated without unacceptable impacts on surrounding environment. Areas where new infrastructure can be located with low visibility from the surrounding landscape. Areas not visible from Primitive or Wilderness Zones. Areas with available potable water, and not sensitive to disposal of treated wastewater via soak away.	Picnicking. Walking or bicycle access into adjacent areas. Self-catering accommodation and camping. Meeting, workshops or mini-conference activities for no more than the number of people that can be accommodated overnight in the zone. Can provide for Environmental Education accommodation and access into surrounding landscapes, but this must be carefully planned not to conflict with visitor use.	Reception offices. Self-catering accommodation and camping for up to 100 guests in total at any time[1] Single small lodges for up to 30 guests are permissible if all facilities are contained in a compact footprint, this represents the total accommodation for the zone, and any restaurant or catering facilities are for overnight guests only. If possible roads should be narrow with separate incoming and outgoing routes; otherwise double vehicle width roads are strongly advisable for safety and usability. Roads in this zone should be surfaced to reduce management cost and environmental impacts. Development and infrastructure may take up a significant proportion of the zone, but planning should ensure that area still provides relatively natural outdoor experience.	Motorised self-drive 2x4 sedan car access. Tour bus access. Parking areas. This zone should be used to provide parking and walk-in access for day visitors to adjacent Nature Access zone if possible.	***Visitor Management:*** Use infrastructure solutions such as railings, hard surfacing and boardwalks to manage undesirable visitor impacts. Accept negative impacts on natural habitats in this zone unless these are specifically addressed in a Special Management Overlay. Frequent footpath and road maintenance must be scheduled for high impact routes. Visible impacts to adjacent Zones should be considered and mitigated. ***Conservation Management:*** Provide access and generate revenue. Management should aim to mitigate the impacts of the high number of visitors. Largely transformed habitats with lower management requirements. Usually fire exclusion areas. Prevent or rehabilitate visible trampling or any other visitor impact. Plan for a compact overall development footprint, avoiding dispersed infrastructure that will increase fire risk and/or environmental footprint. This is most critical in fire-prone environments. ***Consumptive Use:*** Sustainable use may be appropriate subject to a formal assessment and application in accordance with CapeNature policies.

[1] Although 100 guests seem high this is in line with CapeNature sites that would fall within this zone definition, *e.g.* configured as 10 x 4-sleeper self-catering units and 15 campsites.

Zone	Zone Objective	Characteristics	Visitor Activities	Facilities / Infrastructure	Visitor Access	Management Guidelines
Development – High Intensity	***Users:*** To provide access to adjacent natural landscapes with no expectation of solitude. To provide low and/or higher density accommodation. May provide some conveniences such as restaurants and shops. ***Conservation:*** To locate the zone and infrastructure to minimise impact on sensitive environments. To actively manage users and visitor impacts on adjacent sensitive areas. *Provide additional protection to sensitive or threatened habitats, species or other features by Special Management Overlays*	Areas with extensive degraded or transformed footprints. Natural or semi-natural habitats only where benefits outweigh impacts. Areas able to accommodate very high numbers of visitors regularly, with no identified sensitive biodiversity. Areas able to accommodate roads, trails and accommodation infrastructure without risk. Areas easily accessible from reserve management centre. Areas where risk of fire damage to infrastructure is low or can be mitigated without unacceptable impacts on surrounding environment. Areas where new infrastructure can be located with low visibility from the surrounding landscape. Areas not visible from Primitive or Wilderness Zones. Areas with available potable water, and not sensitive to disposal of larger amounts of treated wastewater.	Restaurants and small shops. Picnicking. Walking or bicycle access into adjacent areas. Accommodation in small hotels, lodges and higher density self-catering accommodation and/or camping. Meetings, workshop or mini-conference activities for no more than the number of people that can be accommodated overnight in the zone.	High density tourism development nodes`. Modern amenities including restaurants & shops. Self-catering accommodation and camping for over 100 guests in total at any time. Lodges or small hotels. Roads in this zone must be surfaced to reduce management cost and environmental impacts. Development and infrastructure may take up a significant proportion of the zone, but planning should ensure that area still provides relatively natural outdoor experience.	Tour bus access. Motorised self-drive sedan car access. Parking areas. Air access only permitted if considered and approved as part of zoning scheme and there is no possibility of faunal disturbance.	***Visitor Management:*** Management action will focus mostly on maintenance of facilities & providing high quality experiences. Use infrastructure solutions such as railings, hard surfacing and boardwalks to manage undesirable visitor impacts. Accept substantial impact on natural habitats in this zone unless these are specifically addressed in a Special Management Overlay. Frequent landscape, footpath and road maintenance must be scheduled for high impact areas. Visible impacts to adjacent Zones should be mitigated. ***Conservation Management:*** Provide access and generate maximum revenue. Management should aim to mitigate the biodiversity impacts of the high number of visitors only in sensitive areas (if any) identified by Special Management Overlay. These are highly transformed habitats with lower management requirements. Natural fire exclusion areas. Prevent or rehabilitate visible trampling or any other visitor impact. Plan for a compact overall development footprint, avoiding dispersed infrastructure that will increase fire risk and/or environmental footprint. This is most critical in fire-prone environments. ***Consumptive Use:*** Sustainable use unlikely to be compatible.

Zone	Zone Objective	Characteristics	Visitor Activities	Facilities / Infrastructure	Visitor Access	Management Guidelines
Development - Management	Location of infrastructure and facilities for Reserve Administration & especially conservation management facilities Not compatible with tourism and tourism access.	Areas with extensive degraded or transformed footprints. Natural or semi-natural habitats only where benefits at reserve scale outweigh local impacts. Areas able to accommodate high disturbance, with no identified sensitive biodiversity. Areas providing easy access to reserve and infrastructure. Areas very close to zones requiring highest management intervention, especially Low/High Intensity Zones. Areas where risk of fire damage to infrastructure is low or can be mitigated without unacceptable impacts on surrounding environment. Areas where new infrastructure can be located with low visibility from the surrounding landscape. Areas not visible from Primitive or Wilderness Zones. Areas with available potable water, and not sensitive to disposal of treated wastewater.	n/a	Any reserve management infrastructure including offices, sheds, garages, stores, *etc.* Roads required to access these should be surfaced to reduce long-term maintenance costs and environmental impact. *NOTE* *Reserve administrative offices may also be located within visitor reception facilities in Development - Low/High Intensity Zones*	none	***Visitor Management:*** n/a ***Conservation Management:*** Frequent footpath and road maintenance must be scheduled for high impact routes. Accept some impact on natural habitats in this zone unless these are specifically addressed in a Special Management Overlay. Visible impacts to adjacent Zones should be mitigated. Management should aim to contain all activities within the smallest possible footprint. Largely transformed habitats with lower management requirements. Usually fire exclusion areas. Prevent or restore trampling or any other management impact. Plan for a compact overall development footprint, avoiding dispersed infrastructure that will increase fire risk and/or environmental footprint. This is most critical in fire-prone environments. ***Consumptive Use:*** Sustainable use unlikely to be possible in small zone.

Zone	Zone Objective	Characteristics	Visitor Activities	Facilities / Infrastructure	Visitor Access	Management Guidelines
Development - Production	Commercial or subsistence farming. (only applicable to privately owned & managed Contract Nature Reserves)	Areas identified for production farming. Areas with extensive degraded or transformed footprints. Natural or semi-natural habitats only when use of these areas is supported by a bioregional plan and specialist site assessment.	May allow agri-tourism	Any agricultural infrastructure.	May allow agri-tourism	Agricultural best practise to support surrounding natural areas, particularly with regard to river and wetland buffer areas.
Development – Private Areas	Private dwelling and surrounds. (only applicable to privately owned & managed Contract Nature Reserves)	Private homestead. Areas with existing degraded or transformed footprints. Natural or semi-natural habitats only when use of these areas is supported by a bioregional plan and specialist site assessment.	n/a	Dwellings and private accommodation areas. Roads to access these.	No access by the public without permission from landowner.	Should have no negative impacts on the surrounding conservation area.

Protection Zones

Zone	Zone Objective	Characteristics	Visitor Activities	Facilities / Infrastructure	Visitor Access	Management Guidelines
Species / Habitat / Cultural Protection	***Users:*** This zone's primary purpose is conservation and research. Limited tourism use only if compatible with conservation objective. ***Conservation:*** Protection of species or habitats of special conservation concern. Restrict access to prevent disturbance and/or damage.	Larger areas where uncontrolled public access is undesirable due to presence of regionally critically rare and endangered fauna, flora, habitat. Typical example would be a seabird breeding colony, particularly for threatened species.	Research. Nature observation under strictly controlled conditions only if specifically noted.	Usually none, but footpaths and tracks to allow management access may be permitted. Where visitor access is permitted, strict access control infrastructure is required to delimit access routes, and if necessary screen visitors. *I.e.* hides, boardwalks, screened routes, and paths with railings may be appropriate.	Public / Tourism access normally not allowed. May be permitted under very tightly controlled conditions, to be determined per site.	***Visitor Management:*** Prevent visitor access or restrict numbers of visitors and allow for no-use rest periods if required. Infrastructure layout, design and construction must be designed and maintained to highest environmental standards. ***Conservation Management:*** Feature specific – as required. Prevent any negative impacts on identified feature/s. Consider removal and/or rehabilitation of non-essential infrastructure. ***Consumptive Use:*** Not compatible.

Special Management Overlays

Special management overlays provide an indication of areas requiring special management intervention within the above zones. Overlays would typically only be applied where zoning does allow visitor or management access, but special measures are required, particularly to ensure protection of important and sensitive features or sites. Overlays should include specific indication of permitted activities, access, facilities/infrastructure and management guidelines that differ from the rest of that zone. Overlay requirements can be flexible, adapted to the requirements of the feature/s they protect.

Overlay	Overlay Objective	Characteristics	Visitor Activities	Facilities / Infrastructure	Visitor Access	Management Guidelines
Cultural	Protection of localised identified important Cultural Feature.	Can overlap any zone. Permanent, temporary or temporal zone to manage important cultural or heritage features.	Specific activities dependent on ability to manage activity and feature in question.	Usually none, but specific infrastructure dependent on feature in question.	Specific access dependent on ability to manage access and feature in question.	Feature specific – as required.
Species / Habitat	Protection of localised identified important Biodiversity Feature	Can overlap any zone. Permanent, temporary or temporal zone to manage important and sensitive species and/or habitats. Typically only applied where visitor impacts are expected.	Specific activities dependent on ability to manage activity and feature in question.	Usually none, but specific infrastructure dependent on feature in question.	Specific access dependent on ability to manage access and feature in question.	Feature specific – as required.
Visual	Protection of sensitive view sheds and particularly for Wilderness Zone view sheds.	Can overlap any zone. Sensitive view sheds and particularly for areas within Wilderness Zone view sheds.	Specific activities dependent on ability to manage activity and feature in question.	No roads, firebreaks or buildings. No visible infrastructure. Trails may be appropriate.	Walking access likely to be appropriate.	Feature specific – as required.
Natural Resource Access	Access to identified sustainable consumptive use resources as per a resource management plant.	Can overlap any zone except Wilderness and Protection zones. Areas with identified natural resources formally assessed as not sensitive to harvesting and where an approved sustainable harvesting plan is in place.	Harvesting of identified resources.	None	Specific access dependent on feature in question.	Feature specific – as required.

Research is usually permissible in all zones, except Species/Habitat protection or Cultural Protection where it may be restricted. Research that requires destructive harvesting or manipulation of more than a few square metres of habitat should not be considered in any of the Protection overlays, except where research outputs are considered essential for management of that ecosystem, research cannot be done at an equivalent site elsewhere, and research results are certain to contribute substantially to management objective.

Key drivers of the ANR&WHS's zonation:

- ANR&WHS is a large-sized protected area of 79 629 ha, that has been established because of its importance as a water catchment area, its protection of the local Succulent Karoo, Fynbos and Subtropical Thicket biodiversity and the establishment of ecological corridors along west-east and north-south gradients. For management purposes, it has been split into six sectors: Anysberg Mountain; Vrede Vallei; Kleinspreeufontein; Touwsfontein; Allemorgensfontein; and Grand Canyon.
- All of the SA vegetation types (Mucina & Rutherford 2006) represented in ANR&WHS are Least Threatened, except for Montagu Shale Renosterveld, which is classified as Vulnerable and poorly protected (Pence 2014). At a fine-scale vegetation level, only the Buffels River and floodplain unit is Endangered and partially protected (Klein Karoo Ecosystem Status, Reyers & Vlok 2008; Skowno *et al*. 2010).
- Large sections of the veld in ANR&WHS (particularly of the Grand Canyon, Allemorgensfontein Touwsfontein sectors) are at different stages of natural recovery. Resting of the veld allows for the palatable species, which had been subject to continuous grazing previously, to flower, set seed and recruit following good rainfall events. Over the years no less than 20 confirmed undescribed plant species have been recorded on ANR&WHS, most of which are highly palatable to stock and game. In addition, there are at least 40 other plant species that are of conservation concern. Parts of the Kleinspreeufontein, Vrede Vallei, Grand Canyon and Touwsfontein sectors provide high quality habitat for Cape mountain zebra; and towards the western extent of Allemorgensfontein, riverine rabbit have been recorded. The areas harbouring these species are considered sensitive to disturbance and could qualify as 'Habitat Protection Zones', but are included in the low use Primitive Zone, because of the extensive areas covered.
- The northern section of Kleinspreeufontein and the eastern section of Grand Canyon have large, remote areas that are essentially inaccessible (except via the limited management tracks). These areas can provide a true wilderness experience and opportunities for leave-no-trace activities, and hence could fall within the Wilderness Zone category. Due to time constraints no analysis of viewsheds or visual sensitivity could be performed, but this should be investigated during the next 10 years.
- The reserve is managed from the Vrede Vallei sector where the main office complex, staff village (Vaughanville) and other management buildings are located. All these buildings as well as the manager's house at Goedehoop fall within the Development Management Zone. The existing buildings on Allemorgensfontein (main house and buildings at Kruisrivier; main house, old cash store, sheds, railway houses at Allemorgens), Touwsfontein (main houses and buildings at Muckleneuk and Dammetjies), and Kleinspreeufontein (main house and other buildings) are currently only used for management purposes and therefore also fall within the Development Management Zone category. The same applies to all the buildings (*i.e.* foreman's house, staff cottages, store, shed) situated near the entrance gate of Grand Canyon, including the labourer's house and store at the eastern extent near the Buffels River.
- The majority of the tourism infrastructure is located near the Vrede office complex, and includes five self-catering cottages (sleeps 20 people in total), five campsites and an ablution facility (for 30 people in total) – these all form part of the Development Low Intensity Zone. An additional self-catering cottage is planned for the open space adjacent to Gecko cottage (sleeps six people in total), which fits in with the Development Low Intensity Zonation.

- Tapfontein overnight facility consists of four wendy houses (sleeps eight in total) and the main house at Grand Canyon which is currently being upgraded as a tourism facility that can sleep eight people (hence less than 16 guests) fall within the Primitive Zone.
- There are two 4x4 routes (Anysberg Mountain and the Tapfontein circular route) which can only be used by visitors that are booked in the accommodation units. One day trail is available for visitors to use, but access is only by permit. All these fit in the Primitive Zonation.
- Although the tourism potential for Allemorgensfontein, Kleinspreeufontein and Touwsfontein is high, these sectors have no tourism accommodation that is open to the general public. No tourism development is identified in the business plan (CapeNature 2017) for these sectors. They are therefore zoned to reflect limited tourism potential due to the relative remoteness and difficult access, and to allow for protection of the intrinsically wild appearance and character of the area - Primitive Zone. Tourism infrastructure and related activities are largely confined to Vrede Vallei, mainly for logistical and management reasons.
- Grand Canyon is traversed by the Ladismith-Laingsburg district road. The subordinate road to Montagu and Touwsrivier along the valley through Grand Canyon, Vrede Vallei and Allemorgensfontein is a public road. All these roads are to be maintained by the Central Karoo District Municipality in the east and the Cape Winelands District Municipality in the west. All the public roads are zoned Nature Access Zone – but a high clearance vehicle is required to drive on them. All other tracks and trails within ANR&WHS are maintained by CapeNature and fall within the Primitive Zone.

The zonation of the ANR&WHS is shown in Map 14.

5.3 Access

The general public need to be provided with access to all provincial protected areas. Access points must be easily accessible to relevant user groups, but controlled by protected area staff. Access points on ANR&WHS for the public are listed in Table 5.5. Access and specific facilities are spatially mapped in Map 15.

Table 5.5: Access points to the Anysberg Nature Reserve and World Heritage Site.

No.	Locality	Name	Type of Access	Activity
1	Grand Canyon	CapeNature Anysberg Main Entrance Gate	Public access gate (high clearance 2x4 vehicles).	Public access through ANR&WHS.
2	Skerpkrantz	Edgar Kuhn	Public access gate (high clearance 2x4 vehicles)	Public access
3	Kruisrivier	Deon Roodt	Public access gate (high clearance 2x4 vehicles)	Public access through ANR&WHS.
4	Spitskop	Andre Loots	Public access gate (high clearance 2x4 vehicles)	Public access through ANR&WHS.
5	Grootspreeufontein	Pieter Fourie	Public access gate (locked gate; 4x4 vehicles)	Access for management purposes.

No.	Locality	Name	Type of Access	Activity
6	Klipfontein	Abri Meiring	Road deproclaimed (locked gate)	Private road to Fisantekloof. Access for management purposes.
7	Klipfontein	Abri Meiring	Road deproclaimed (locked gate)	Private road to Kleinspreeufontein. Access for management purposes.
8	Grand Canyon	CapeNature	Road deproclaimed (locked gate)	Access for management purposes.

CapeNature is a partner in a number of servitude agreements for which the respective partners are provided access to land managed as part of the ANR&WHS. Current servitudes are listed in Table 5.6 and shown on Map 15.

There is no servitude agreement between CapeNature and the Department of Transport on the main road from the gate at Grand Canyon to the gates at Kruisrivier and Spitskop. This road is dealt with according to the Road Ordinance as a subordinate road with a reserve width of 20 m. Maintenance of these roads will only be done if a written request has been submitted and only if capacity in terms of funding and/or personnel are available (Kobus Theron, Central Karoo District Municipality; pers. comm.).

Table 5.6: Servitudes and management agreements of the Anysberg Nature Reserve and World Heritage Site.

Date of Agreement	Type of Agreement	Partner	Duration of Agreement (years)	Area Affected
12/11/1987	Management agreement	Mr. A van den Berg	50 years	De Vlakte 265
12/03/1999	Lease agreement	Eskom	In perpetuity	Witte Poort 259
30/06/2000	Donation to WWF-SA and conservation management agreement	George Moggach & WWF-SA	In perpertuity	Grootvlakte 23 & Rietkraal 22
4/08/2001	Touwsfontein house agreement	George Moggach & WWF-SA	In perpertuity	Touwsfontein 1
23/01/2004	Lease Agreement	WWF-SA	99 year lease	Allemorgensfontein
23/01/2004	Lease Agreement	WWF-SA	99 year lease	Touwsfontein
01/09/2011	Lease Agreement	Vodacom	9 years and 11 months	Wilgerfontein 258
1987	Lease Agreement	WWF-SA	99 year lease	Kleinspreeufontein
2012	Lease Agreement	WWF-SA	99 year lease	Grand Canyon
	Public Road - Managed in terms of Road Ordinance	Central Karoo District Municipality		Grand Canyon, Vrede Vallei, Allemorgensfontein

Date of Agreement	Type of Agreement	Partner	Duration of Agreement (years)	Area Affected
	Public Road - Managed in terms of Road Ordinance	Cape Winelands District Municipality		Allemorgensfontein

5.4 Concept Development Plan

A business plan for ANR&WHS was development by Gordan (2009) and updated in March 2017 (CapeNature 2017).

The ANR&WHS is made up of six individual sectors namely: Allemorgensfontein, Anysberg Mountain, Grand Canyon, Kleinspreeufontein, Touwsfontein and Vrede Vallei. Although the tourism potential for Allemorgensfontein, Kleinspreeufontein and Touwsfontein is high, tourism infrastructure and related activities are, for logistical reasons, largely confined to Vrede Vallei. Except for Tapfontein which is situated 15 km away from the main centre, all Anysberg tourism infrastructure is located within a 1 km radius of the main centre where the offices, staff houses and other management infrastructure (excluding the 4x4 routes and overnight hiking trail) are situated.

Existing tourism infrastructure includes five cottages Agama (sleeps four people), Gecko (sleeps two people), Chameleon (sleeps five people), Leguaan (sleeps six people) and Seps (sleeps three people), five camping sites (sleeps six people each) and Tapfontein (sleeps eight people). There are also two 4x4 routes (Anysberg Mountain and the Tapfontein 23 km circular route), the two-day guided horse trail and the Land se Kloof hiking trail (1.5 km).

Infrastructure development proposals for the 2018-2023 period

- Grand Canyon main house (sleeps eight people)
  It has been decided that the main house at Grand Canyon will be turned into a tourism unit. The proposed site is located about 4 km away from the eastern entrance gate. New furniture needs to be purchased for the house.

- Building of a new self-catering cottage (six sleeper) in the same area where the other five are located. A full application needs to be prepared, submitted and due process will be followed to obtain all the necessary approvals in terms of the relevant legislation. This process will be driven by reserve management with support from the Marketing and Eco-Tourism Directorate.

Status and maintenance of existing infrastructure

- Firebreaks
  Firebreaks on the ANR&WHS will be maintained on the fire prone boundaries according to the firebreak register which is updated annually.

- Infrastructure
  Buildings and major infrastructural projects will be maintained by the Department of Transport and Public Works according to the U-AMP. Roads, trails and fences will be

assessed on an annual basis through the Integrated Work Planning process and general maintenance will be carried out according to the APO. Certain roads and tracks have been identified as priorities for closure. These will be closed and rehabilitated through the Integrated Work Planning process and included in the IAPO.

6) STRATEGIC IMPLEMENTATION FRAMEWORK

The SIF guides the implementation of the management plan over 10 years in order to ensure that it achieves its management objectives. The SIF translates the information described in Sections 3, 4 and 5 above into management activities and targets, which will be used to inform annual plans of operation as well as the resources required to implement them. The management targets will form the basis for monitoring of performance in implementing the plan and are thus measurable.

The SIF is discussed under the following sections. The guiding principles of these sections are discussed in the Co-ordinated Policy Framework.

6.1 Legal status and reserve expansion

6.2 Regional integrated planning and cooperative governance

6.3 Ecosystem and biodiversity management

6.4 Wildlife management

6.5 Fire management

6.6 Invasive and non-invasive alien species management

6.7 Cultural and heritage resources

6.8 Law enforcement and compliance

6.9 Infrastructure management

6.10 Disaster management

6.11 Socio-economic framework

6.12 Management Effectiveness

6.13.1 Finance and administration management

6.13.2 Human resources management

6.13.3 Occupational health and safety management

6.13.4 Risk management

6.14 Visitor management

6.15 Tourism development framework

6.1	LEGAL STATUS AND RESERVE EXPANSION				
Objective 3 **Objective 4**	To secure the conservation estate. To expand the conservation estate.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• The ANR&WHS has secure permanent legal conservation status in terms of NEM: PAA.	• Formalise legal status of State Forest Land. • Formalise the legal status of Grand Canyon and Hugh properties by completing the declaration process and including proclamations in the management plan. • Ensure ANR&WHS is listed in the national protected areas register as required by NEM: PAA.	Executive Director: Conservation Managment; Land Affairs Manager; Senior Manager: Protected Area Expansion & Stewardship.	The ANR&WHS is legally secure.	Year 1-3	NEM: PAA; Deeds office; Government gazette; Western Cape Protected Area Expansion Strategy (WCPAES).
• The ANR&WHS boundary is known and appropriately demarcated and secure.	• Demarcate boundaries and ensure that these are known by reserve management, neighbouring landowners and the public. • Address Kruisrivier boundary issue wrt use of dam.	Conservation Manager; Land Affairs Manager; Marketing & Eco-Tourism Manager.	1500 ha added to the conservation estate.	Year 1-3	CN Boundary verification process.
• The ANR&WHS design (size and shape) is adequate to achieve the conservation objective in the Management Plan.	• Identify potential stewardship agreements with the surrounding landowners in line with priority corridors. • Ensure local strategy for ANR&WHS expansion is included in WCPAES. • Maintain stewardship agreements with neighbouring landowners.	Conservation Manager; Scientific Services Manager; Senior Manager: Protected Area Expansion & Stewardship; LHSKT Stewardship Programme Facilitator.		Years 1-10	LHSKT Stewardship Programme Phase 2; WCPAES.
• To consolidate all possible land within the ANR&WHS, as well as other identified conservation-worthy areas adjacent to and contiguous with the reserve as identified.	• Identify potential stewardship agreements with the surrounding landowners in line with WCPAES. • Maintain stewardship agreements with neighbouring landowners. • Maintain all management agreements. • Follow-up with WWF-SA regarding the potential donation of De Vlakte to WWF-SA.	Conservation Manager; Protected Areas Manager; Regional Manager; Senior Manager: Protected Area Expansion & Stewardship; LHSKT Stewardship Programme Facilitator.		Years 1-10	CapeNature Protected Area Expansion Strategy and Implementation Plan 2015-2020; Extension nomination for the Cape Floral Region Protected Areas World Heritage Site

Budget Allocation	**Development**	R0
	Operation (10 Year Forecast)	R 278 222

6.2	REGIONAL INTEGRATED PLANNING AND COOPERATIVE GOVERNANCE				
Objective 3 **Objective 4**	To secure the conservation estate. To expand the conservation estate				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• The ANR&WHS is integrated into land-use planning outside of the nature reserve.	• Identify projects to include in SDFs and IDPs. • Integrate with the SDFs and IDPs of the Kannaland, Laingsburg and Langeberg Local Municipalities, and Central Karoo, Eden and Cape Winelands District Municipalities. • Provide comments on development or landuse change proposals adjacent to the ANR&WHS (*e.g.* fracking, renewable energy developments, *etc.*).	Community Conservation Manager; Conservation Manager; Senior Manager: Protected Area Expansion & Stewardship.	The protected area is integrated into land-use planning outside of the protected area. The protected area is incorporated in local and district municipal SDFs and IDPs. Comments are provided on developments or landuse change proposals adjacent to the protected area.	Years 1-10	Intergovernmental Relations Framework Act, 2005 (Act 13 of 2005). NEMA regulations.
• Water-use planning outside the ANR&WHS takes into account the objectives of the ANR&WHS.	• Attend Buffelsrivier Water Users Association meetings when relevant. • Determine how ANR&WHS fits into Breede Gouritz Catchment Management Agency.	Conservation Manager; Scientific Services Manager; Aquatic Scientist.		Years 1-10	National Water Act, 1998 (Act 36 of 1998)
• Establish a functioning Advisory committee for the ANR&WHS.	• Maintain a Protected Area Advisory Committee (PAAC) for the ANR&WHS. • Attend and participate in PAAC meetings.	Protected Areas Manager; Community Conservation Manager; Conservation Services Manager; Conservation Manager; LHSKT Stewardship Programme Facilitator.	Advisory committee for the ANR&WHS has been established. At least two PAAC meetings taking place per annum.	Years 1-10	Ref Section 10.1.3; Regulations for the proper administration of nature reserves (2012). CapeNature Stakeholder Process, PAAC Terms of Reference, ANR&WHS integrated management plan.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 278 222

6.3	ECOSYSTEM AND BIODIVERSITY MANAGEMENT				
Objective 1 **Objective 2**	To conserve the natural ecosystems. To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• Compile and implement the Project Protocols and Standard Operating Guidelines and Ecological Matrix for ANR&WHS.	• Develop and implement an approved Ecological Matrix for ANR&WHS. • Collate all relevant monitoring and research protocols and data sheets to inform the Project Protocols and Standard Operating Guidelines. • Analyse data, conduct annual review of Ecological Matrix and protocols and re-assess and implement adaptive management strategies.	Conservation Manager; Ecological Co-ordinator; Regional Ecologist; Protected Areas Manager.	Ecological Matrix developed and implemented annually. Ecological plan of operations developed and available. Implementation of Ecological Matrix reviewed annually.	Years 1-10	Baseline data collection and monitoring manual (2010); Ecological Plan of Operations.
• A biodiversity resource inventory for the ANR&WHS is in place.	• Prioritisation of species for inclusion on the Ecological Matrix and Project Protocols and Standard Operating Guidelines. • Collect species data and submit to Scientific Services. • Analyse data, re-assess and implement adaptive management strategies. • Hard and digital copies of all documents and publications resulting from all monitoring and research in the reserve must be catalogued and stored at the ANR&WHS office with backup copies sent to Scientific Services.	Conservation Manager; Ecological Coordinator; Regional Ecologist; Scientific Services Manager.	Priority species identified and data collected. SOB database updated.	Years 1-10	Baseline data collection and monitoring manual (2010); Ecological Plan of Operations. Ecological Matrix
• A monitoring programme for the ANR&WHS is being implemented.	• Review monitoring protocols. • Identify monitoring needs of the reserve in consultation with Scientific Services. • Establish indicators for monitoring. • Implement monitoring activities as per the Ecological Matrix. • Report on monitoring activities as per the Ecological Matrix. • Analyse data, re-assess and implement adaptive management strategies. • Implement relevant monitoring of national projects and/or programmes.	Conservation Manager; Ecological Coordinator; Regional Ecologist; Scientific Services Manager.		Years 1-10	Baseline data collection and monitoring manual (2010).

Key Deliverables	Management/Monitoring Activities	Responsibility	Indicators	Timeframe	Existing Procedures
• A research programme for the ANR&WHS is being implemented.	• Identify research needs for the reserve. • Develop and implement an applied research programme for the reserve in consultation with Scientific Services. • Results of research projects are fed back to the management of the reserve. • Results are used to adapt management of the nature reserve where relevant. • Provide support to researchers as per Ecological Matrix and research permit conditions.	Conservation Manager; Ecological Co-ordinator; Regional Ecologist; Scientific Services Manager.	Research needs list. Researcher visitors register completed annually. Researcher reports received, management actions identified and implemented where relevant.	Years 1-10	Baseline data collection and monitoring manual (2010); Project Protocols and Standard Operating Guidelines; Ecological Matrix.
• The ANR&WHS contributes to the maintenance of ecosystem services.	• Design and implement appropriate fire (Refer to Table 6.5) and alien invasive management (Refer to Table 6.6) programmes. • Implement monitoring as per the Ecological Matrix.	Conservation Manager; Ecological Co-ordinator; Regional Ecologist; Catchment Manager; Programme Manager: ICM; Programme Manager: Green Jobs.	Integrated Workplan and IAPO developed, reviewed and implemented.	Years 1-10	ICM Standard Operating Procedures; Fire Management Policy.
• Prevent and mitigate soil erosion on the ANR&WHS.	• Conduct a trail, jeep track and roads assessment as per ICM standards. • Through regular monitoring identify areas that require stabilisation and remediation. • Compile an erosion maintenance plan. • Close and rehabilitate inappropriate trails, jeep tracks and roads in accordance with assessment report. • Map and ensure photo's available. • Monitor the effectivity of the erosion control mitigation. • Monitor cost effectiveness of maintenance. • Monitor site recovery.	Conservation Manager; Ecological Co-ordinator; Regional Ecologist; Catchment Manager.		Years 1-10	ICM Standard Operating Procedures; Project Protocols and Standard Operating Guidelines.
• Mitigate the impacts of groundwater abstraction on the reserve.	• Purchase required groundwater monitoring equipment regionally. • Monitor groundwater abstraction at abstraction points.	Conservation Manager; Protected Area Manager; Aquatic Scientist.	Groundwater monitoring equipment purchased regionally. Abstraction data collected.	Years 1-10	Project Protocols and Standard Operating Guidelines.
• Conserve and protect rivers.	• Conduct follow-up SASS5 monitoring in the Buffels and Touws rivers when the re-survey of the fish status takes place every second year. • Implement any action necessary as recommended by SASS5 results.	Conservation Manager; Ecological Co-ordinator; Regional Ecologist; Catchment Manager; Aquatic Scientist.		Every 2nd year	Baseline & Monitoring Manual 2010.

Key Deliverables	Management/Monitoring Activities	Responsibility	Indicators	Timeframe	Existing Procedures
	• Verify aquatic CBA and NFEPA information for the ANR&WHS.				
• Rehabilitate and conserve wetlands.	• Identify and map all wetlands and seeps. • Investigate appropriate monitoring strategy for wetlands and seeps if relevant. • Close, re-align or rehabilitate roads that negatively impact on wetlands as identified in road assessment report as per maintenance schedule.	Conservation Manager; Ecological Co-ordinator; Regional Ecologist; Catchment Manager; Aquatic Scientist; Tourism Manager; GIS Technician.		Year 1-5	Working for Wetlands procedures, NFEPA
• Conserve the unspoilt natural landscape of the ANR&WHS.	• Ensure that infrastructure development is non-obtrusive and environmentally friendly within specific identified zones. • Provide comments on developments that may impact on ANR&WHS.	Conservation Manager; Tourism Manager; Scientific Services: Land use advice.	Infrastructural development within specified zones. No new structures are "skylined" and visual impact of old structures mitigated. Environmental authorisations acquired, complied with and filed. Environmental Management Plan (EMP) compiled and complied with. "Green" technology implemented fully. Comments submitted on developments.	Years 1-10	CDF, National Environmental Management Act (NEMA) legislation
• Protect flora species of conservation concern.	• Identify species and localities of populations on the ANR&WHS. • Conduct monitoring of populations of plant species of conservation concern on the reserve. • Limit activities that may impact on plant species of conservation concern. • Vigilant patrolling and monitoring of illegal collecting of succulent plants.	Conservation Manager; Ecological Co-ordinator; Regional Ecologist; Botanical Scientist.	Priority species list compiled. Threatened species datasheets completed SOB database updated.	Years 1-10	Baseline data collection and monitoring manual (2010); Threatened species programme.
• Manage consumptive utilisation of biological resources.	• Database established indicating all utilised species and the extent of their use within the reserve.	Conservation Manager; Community Conservation Manager; Ecological Co-ordinator; Regional Ecologist.	CapeNature Policy on consumptive utilisation and the Environmental Management Plan.	Years 1-10	CN Policy on consumptive utilisation.

Key Deliverables	Management/Monitoring Activities	Responsibility	Indicators	Timeframe	Existing Procedures
• Conserve threatened and endemic fauna.	• Regular monitoring of Cape mountain zebra population dynamics. • Conduct census of Cape mountain zebra on reserve and other game species. • Progress with Biodiversity management plan for species (BMP-s) for Cape mountain zebra. • Participate in research project focussed on the distribution and habitat requirements of the Riverine rabbit. • Map the location and distribution of all threatened species in the ANR&WHS and data to be captured in SOB database • Monitoring (every 2 years) of the Buffels and Touws rivers for determining the status of the smallscale redfin (*Pseudobarbus asper*). • SABAP2 to be carried out on those areas of the reserve that are under surveyed.	Conservation Manager; Conservation Services Manager; Mammalian Scientist; Ecological Co-ordinator; Regional Ecologist.	SOB database updated. Cape mountain zebra identikit register maintained. Game on reserves database updated. Species distribution maps compiled. SABAP2 data captured electronically.	Years 1-10	Baseline data collection and monitoring manual (2010). Norms and Standards for the compilation of Biodiversity Management Plans for Species (BMP-s) in terms of National Environmental Management: Biodiversity Act (NEM: BA).

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 5 564 440

6.4	WILDLIFE MANAGEMENT				
Objective 1 **Objective 2**	To conserve the natural ecosystem. To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• Ensure effective game management on ANR&WHS.	• Game on reserve census conducted. • Keep record of numbers and distribution of game species. • Update Cape mountain zebra identikit with photos of individuals. • Investigate Cape mountain zebra impact on natural vegetation and habitat needs, and area preferences. • Record mortalities and collect samples for DNA analysis. • Monitor water availability. • Provide watering points for Cape mountain zebra where critical. • Implement relevant actions as stipulated in Biodiversity Management Plan for species, Cape mountain zebra. • Investigate fence-dropping agreements with landowners to allow wildlife to roam freely. • Identify suitable species and habitat availability to be considered for re-introduction. • Compile a Game management plan.	Conservation Manager; Programme Manager: Wildlife; Mammalian Scientist.	Cape mountain zebra database and SOB updated. Game on reserves database updated. Game management plan compiled and implemented. Relevant management actions in Cape mountain zebra BMP-s implemented.	Years 1-10	Cape mountain zebra BMP-s, GTUP, Baseline data collection and monitoring manual (2010), Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974)
• Ensure that only historically indigenous game species occur in the ANR&WHS.	• Conduct census/counts using various methods: *i.e.* helicopters when funds are available and general foot and vehicle patrols. Maintain database. • Implement removal actions within 12 months by most practical/humane method should extra-limital species be recorded on the ANR&WHS.	Conservation Manager; Conservation Services Manager; Mammalian Scientist; Ecological Co-ordinator; Regional Ecologist.	Game on reserves database updated. No extra-limital species on the ANR&WHS.	Years 1-10	GTUP.
• Manage damage causing/ nuisance fauna.	• Promote best practices regarding damage causing wildlife and promote partnerships (*e.g.* Cape Leopard Trust and Landmark Foundation).	Conservation Manager; Conservation Services Manager; Programme Manager: Wildlife; Ecological Co-ordinator.	Number of damage causing wildlife incidents recorded.	Years 1-10	GTUP, Mountain Catchment Areas Act, 1970 (Act 63 of 1970).

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 2 782 220

6.5	FIRE MANAGEMENT				
Objective 1	To conserve the natural ecosystem.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• Reduce / avoid the spread of fires across the Reserves borders and minimize accidental/deliberate fires within the reserve.	• Compile and maintain a Fire Management Plan for the reserve taking TPCs, adaptive management, social and economic situation into account. • Update and implement Fire Protection and Reaction Plans including risk assessments. • Construct priority firebreaks according to schedule. • Assess appropriateness of current firebreak network and re-align where appropriate. • Negotiate firebreak agreement with neighbours where relevant. • Conduct a pre-fire season fire audit • Conduct a post-fire season audit • Fire Reports completed. • Mapping of all fires and capture on GIS. • De-briefing sessions held after each fire and records kept.	Conservation Manager; Catchment Manager; Protected Areas Manager.	Reserve has a minimum pre-fire season audit score of 90% by Year 5. The distribution and range of veld age is within the limits of acceptable change (TPC). Priority firebreaks completed *versus* planned (%) and km firebreaks completed. Fire report database accurately completed and up to date.	Years 1-10	Veldfire Management Policy and CapeNature Veldfire Management Guidelines; Fire break register; CapeNature Fire Database; ICM APO.
• To allow for natural fire processes to occur without negatively impacting on safety and infrastructure.	• Manage the ANR&WHS as a natural fire zone. • Implement fire control in accordance with the fire management policy. • Fire reports completed. • Mapping of all fires and captured on GIS. • De-briefing sessions held after each fire and records kept.	Conservation Manager; Catchment Manager; Protected Areas Manager; GIS Technician.		Years 1-10	Veldfire Management Policy and CapeNature Veldfire Management Guidelines.
• Establish and maintain partnerships to improve fire management on the ANR&WHS.	• Attend Southern Cape Fire Protection Association meetings.	Conservation Manager; Catchment Manager.	Minutes of meetings attended.	Years 1-10	Veldfire Management Policy and CapeNature Veldfire Management Guidelines.
• Determine and implement thresholds of potential concern for fire management on the ANR&WHS.	• Conduct permanent *Protea* plot monitoring in accordance with the Ecological Matrix. • Conduct post fire regeneration monitoring 12-18 months after fires.	Conservation Manager; Catchment Manager; Ecological Co-ordinator; Regional Ecologist.	Permanent Protea Plot and Post-fire Protea monitoring data collected.	Years 1-10	Veldfire Management Policy and CapeNature Veldfire Management Guidelines; Baseline data collection and

Key Deliverables	Management/Monitoring Activities	Responsibility	Indicators	Timeframe	Existing Procedures
	• Set and monitor TPCs based on *Protea* monitoring data collected and identify hotspot areas where fires need to be kept out for ecological reasons.				Monitoring Manual; Ecological Matrix.
• Wildfires as a result of human negligence are reduced.	• Raise fire awareness for tourists, local communities and staff.	Conservation Manager; Community Conservation Manager; Tourism Manager.		Years 1-10	Veldfire Management Policy and CapeNature Veldfire Management Guidelines; Fire wise Implementation Guidelines.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 278 222

6.6	INVASIVE AND NON-INVASIVE ALIEN SPECIES MANAGEMENT				
Objective 1	To conserve the natural ecosystem (life support systems).				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
Invasive Alien Flora					
• Eradicate alien and invasive species within the ANR&WHS on an on-going basis.	• Identify and map all alien and invasive flora within the ANR&WHS or threatening the Reserve. • ICM informs both fire and alien vegetation management. • Attend regional ICM Meetings. • Compile a Management Unit Clearing Plan (MUCP) as part of Invasive Alien Species Plan. • Prioritise removal in collaboration with ICM standards.	Conservation Manager; Catchment Manager; Ecological Co-ordinator; Regional Ecologist.	All mapping completed (including Grand Canyon sector). All hectares planned for IAP clearing are cleared.	Years 1-10	Invasive Alien Species Plan; MUCP; ICM procedures.
• Monitoring of alien vegetation on the ANR&WHS to inform adaptive management strategies.	• Implement record keeping procedures. • Evaluate records and adapt clearing strategies as needed.	Conservation Manager; Catchment Manager; Ecological Co-ordinator; Regional Ecologist.		Years 1-10	MUCP; ICM procedures.
• Implement biological control as a method of IAP management.	• Release biological control agents for *Tamarix* once available and include in MUCP. • Reintroduce biological control agents for *Sesbania* on neighbouring properties and include in MUCP. • Record details of all biological control releases. • Monitor success of releases.	Conservation Manager; Catchment Manager; Ecological Co-ordinator; Regional Ecologist.		Years 1-10	Working for Water and Department Agriculture Landcare Guidelines; Database of Biological control agents release sites.
• Prevent the introduction of alien and invasive species from neighbouring landowners.	• Ensure surrounding landowners are aware of relevant legislation. • Investigate possibility of introducing bio-control on neighbouring properties.	Conservation Manager; Conservation Services Manager; LHSKT Stewardship Programme Facilitator.		Years 1-10	Working for Water and Department Agriculture Landcare Guidelines; CapeNature Biological control strategy.
Invasive Alien Fauna					
• Prevent the introduction of alien and invasive species.	• No domestic livestock or other alien fauna (including extra-limital game species) will be permitted in the ANR&WHS and will be removed.	Conservation Manager; Conservation Services Manager; Ecological	No invasive alien fauna species recorded in ANR&WHS.	Years 1-10	CN Policy on domestic animals on nature reserves, Baseline Monitoring Manual 2010; GTUP;

Key Deliverables	Management/Monitoring Activities	Responsibility	Indicators	Timeframe	Existing Procedures
	• No introduction of alien and invasive fish species within catchments and rivers (both on and off-reserve) listed as fish sanctuaries.	Co-ordinator; Regional Ecologist; Aquatic Scientist.			CN Policy on fish utilisation.
• Control alien and invasive species within the ANR&WHS on an on-going basis.	• Record alien fauna (including extra-limital game species) occurring on the reserve. • Monitor populations of alien fauna on the reserve and compile removal plan. • Implement removal plan within 12 months after alien animals have been recorded. • In case of domestic livestock these will be removed by arrangement with the rightful owner (eg. by being chased onto the property from where they have escaped, or impounded, depending on the most practical/humane method in consultation with interested and effected parties/owners. • Measure success of control methods utilised. • Involve external stakeholders.	Conservation Manager; Catchment Manager; Ecological Co-ordinator; Regional Ecologist; Programme Manager: Wildlife; Conservation Services Manager.	Removal system in place. No alien and invasive species in the reserve.	Years 1-10	CN Policy on domestic animals on nature reserves; Baseline Monitoring Manual; GTUP.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 1 391 110

6.7	CULTURAL HERITAGE RESOURCE MANAGEMENT				
Objective 7	To effectively conserve our cultural heritage attributes.				
Key Deliverable	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• To protect cultural heritage resources.	• Compile a cultural heritage resource inventory for the ANR&WHS. • Maintain database with up to date information.	Conservation Manager; Tourism Manager; Ecological Co-ordinator; Community Conservation Manager.	Heritage assets and values being managed consistent to objectives.	Years 1-10	Cultural Heritage Resource Management Plan; Specialists reports.
• Cultural heritage resources are managed to meet the protected area objectives.	• Investigate the use of specialist partners to assist with the compilation of a Cultural Heritage Resource Management Plan for the ANR&WHS and determine management priorities. • Implement the Cultural Heritage Resource Management Plan.	Conservation Manager; Tourism Manager; Regional Ecologist.	Cultural Heritage Resource Management Plan developed and approved.	Years 1-5	Cultural Heritage Resource Management Plan.
• Monitor cultural heritage resources.	• Implement recording and monitoring according to the Ecological Matrix.	Conservation Manager; Ecological Co-ordinator		Years 1-10	Baseline & Monitoring Manual; Ecological Matrix.
• Collaboration with partners to ensure the protection and preservation of cultural heritage resources.	• Investigate developing partnerships with specialists to assist with the protection and preservation of cultural heritage resources.	Conservation Manager; Community Conservation Manager.		Years 1-10	Partnership agreements; Specialists reports.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 278 222

6.8	LAW ENFORCEMENT AND COMPLIANCE				
Objective 2	To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• Protection systems are in place and operating effectively.	• All staff must have a working knowledge of all legislation applicable to their function and mandate. • The ANR&WHS staff is adequately capacitated to enforce legislation within the organisation's mandate and does so effectively. • Staff must be formally designated to enforce the relevant legislation. • Staff has the necessary equipment to enable them to do law enforcement effectively. • The nature reserve receives adequate law enforcement support from other sections of the organisation. • Specific relevant training has been identified and staff have received relevant training. • Routine patrols are performed in priority identified priority areas. • Monitor poaching activities within the reserve.	Conservation Manager; Conservation Services Manager; Community Conservation Manager.	Number of peace officers trained and appointed. Number of Environmental Management Inspectors trained and appointed. Biodiversity Monitoring System (BMS) updated.	Years 1-10	Criminal Procedure Act 51 of 1977; Bill of Rights; Constitution of SA; NEMA; NEM: PAA; Nature and Environmental Conservation Ordinance, 1974 (Ordinance 19 of 1974); Regulations 955 of 1975; Protected Areas Regulations; ANR&WHS Compliance Plan.
• Protection systems are in place and operating effectively.	• Control legitimate access. • Develop and implement all standard operating procedures for controlling activities including Reserve compliance plan. • Adjacent communities are engaged in order to promote the reserve, to build relationships and to identify priority areas. • Awareness raising activities are held with adjacent communities in order to raise awareness concerning reserve and biodiversity conservation. • Areas in the nature reserve have been identified and prioritised in terms of conservation value or type of utilisation, *etc.* • Perform regular routine patrols in all identified priority areas. • All compliance documentation is properly completed and retained as Means of verification. • All relevant cases are reported via BMS and documents submitted as verification.	Conservation Manager; Conservation Services Manager; Community Conservation Manager.	Number of quarterly patrols.	Years 1-10	BMS; Karoo Area Biodiversity Plan; ANR&WHS Compliance Plan.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 556 444

6.9	INFRASTRUCTURE MANAGEMENT				
Objective 2	To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• Ensure maintenance of infrastructure and equipment.	• Maintain infrastructure register and maintenance schedule. • The infrastructure necessary to manage the nature reserve effectively is in place (U-AMP). • Assess if staff facilities are adequate to perform critical management activities. • Ensure that there is adequate operational equipment as required for operational management purposes. • Maintenance of infrastructure as scheduled in registers to ensure upkeep and prevent degradation in accordance with standard operating procedures. • Equipment is maintained in good working condition. • Liaise with Department of Transport and Public Works where required. • Immediately effect all minor emergency repairs.	Conservation Manager; Department of Transport and Public Works; Protected Areas Manager.	Maintain infrastructure register. Public Works schedule is maintained.	Years 1-10	Infrastructure register; Standard Operating Procedures: ICM document; Public Works maintenance schedule; U-AMP.
• Align all existing infrastructure to the CDF and zonation.	• Assess infrastructure development appropriateness to the CDF. • Identify infrastructure that needs to be upgraded or removed. • Identify new infrastructure required.	Conservation Manager; Conservation Planner; Protected Areas Manager; Tourism Manager; Regional Ecologist; Ecological Co-ordinator.	Infrastructure in line with CDF zonation.	Years 1-10	CDF; Environmental Imapct Assessment Regulations.
• Roads/Jeep Tracks and Trails are managed to minimise impact on the environment.	• Conduct annual assessment of roads, Jeep tracks and trails in the ANR&WHS. • Implement maintenance schedule as part of the ICM APO. • Re-align road network and align with the CDF where required. • Rehabilitate where necessary following Standard Operating Guideline (SOG) on road and trail rehabilitation. • Borrow pits mapped, assessed and rehabilitated according to relevant SOG (where required).	Conservation Manager; Catchment Manager; Ecological Co-ordinator; Regional Ecologist; Community Conservation Manager; Protected Areas Manager.	Infrastructure maintenance schedule is adhered to.	Years 1-10	Infrastructure register and Public Works schedule; Erosion control and road maintenance SOG.

Key Deliverables	Management/Monitoring Activities	Responsibility	Indicators	Timeframe	Existing Procedures
	• Monitor use and impact by keeping record of visitors use and examining problem areas on a regular basis to determine maintenance and repair priorities. • Monitor cost effectiveness of infrastructure maintenance.				
• Buildings are effectively maintained.	• Compile and maintain a building register. • Provide Department of Transport and Public Works with works list to reflect maintenance requirements. • Maintenance or new infrastructure is appropriately planned, approved by the quarterly ecological meeting and if required the Appropriate Environmental Impact Assessment completed. Generic CapeNature Environmental Management Plan applied. • Ensure energy and water saving and environmentally sound options are being implemented by Department of Transport and Public Works (Green Building principals).	Conservation Manager; Programme Manager: ICM; Tourism Manager.	Infrastructure maintenance schedule adhered to.	Years 1-10	Infrastructure register; Department Public Works maintenance schedule.
• Maintain fences according to legislative requirements.	• Conduct ongoing fence monitoring and assessment. • Implement fence maintenance schedule as per priorities determined during annual inspections. • Remove unwanted fences.	Conservation Manager.	Infrastructure maintenance schedule adhered to.	Years 1-10	Infrastructure register.
• Environmental Management: Waste Disposal.	• Maintenance of recycling system to manage waste effectively. • Educate visitors and staff (and local communities) on recycling and effective waste management.	Conservation Manager; Tourism Manager.	Recyclling effectively implemented on ANR&WHS. Awareness campaign implemented.	Years 1-10	Infrastructure and Public Works Schedules; Occupational Health and Safety Act (OHSA), 1993 (Act 85 of 1993).
• Environmental Management: Water	• Maintenance of water reticulation system as scheduled in registers to ensure upkeep and prevent degradation. • Schedule regular inspections. • Educate visitors and staff (and local communities) on appropriate and possible water conservation measures. • Ensure back-up water supply pumps (system) are in place. • Monitor borehole use.	Conservation Manager; Tourism Manager; Programme Manager: ICM; Regional Manager; Protected Areas Manager.	Water supply sustained with limited disruption to water provision. Awareness campaign implemented.	Years 1-10	Infrastructure and Public Works Schedules; OHSA; National Water Act.

Key Deliverables	Management/Monitoring Activities	Responsibility	Indicators	Timeframe	Existing Procedures
• Environmental Management: Sewage	• Maintain effective environmentally friendly sewage facilities in collaboration with Department of Transport and Public Works.	Conservation Manager; Tourism Manager; Protected Areas Manager.	Infrastructure maintenance schedule adhered to. Sewage system is effective and not resulting in any pollution or health risks.	Years 1-10	Infrastructure and Public Works Schedules; OHSA.
• Environmental Management: Energy	• Maintain appropriate technologies on the use of renewable energy sources in existing developments and incorporate into any new designs and developments (Green Building principles).	Conservation Manager; Tourism Manager; Public Works; Protected Areas Manager.	Infrastructure maintenance schedule adhered to. Appropriate technologies introduced in all new developments and where feasible in existing developments.	Years 1-10	National Guidelines.
• Environmental Management: Herbicide, gas and fuel stores	• Maintain fuel and herbicide registers. • Manage herbicide store according to required health and safety standards.	Conservation Manager.	Integrated audit system implemented.	Years 1-10	OHSA; Audits.
• Management of high sites.	• Map all high sites (with photos). • Monitor impacts. • Access control.	Conservation Manager.	All sites mapped.	Years 1-10	CapeNature policy on high sites.
• Signage is appropriate and effective to support management.	• Conduct a signage audit. • Compile a signage register with maintenance plan.	Conservation Managers; Tourism Manager.	Adequate signage is in place.	Years 1-10	Signage register.

Budget Allocation	**Development**	R 17 500 000
	Operation (10 Year Forecast)	R 9 737 770

6.10	DISASTER AND RISK MANAGEMENT				
Objective 2	To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Reference to Existing Procedures**
• Disaster prevention and preparedness	• Conduct a risk assessment and identify areas of potential concern. • Compile and implement disaster management plan for ANR&WHS in accordance with relevant legislation. • Engage and assist with disaster management units from municipalities. • Conduct an annual audit of disaster management plans and mitigation measure readiness. • Annual review and exercise of contingency and evacuation plans.	Conservation Manager; Chief Risk Officer; Catchment Manager.	Approved Contingency Plans	Years 1-10	Fire Management Policy; Occupational Health and Safety (OHS) Policy; Provincial Disaster Plan.
• Disaster response.	• Train staff to ensure capacity to manage and mitigate the effects of disasters. • Procure equipment for disaster response and mitigation. • Participate and assist in District Municipality disaster management structure. • Activate evacuation and contingency plans.	Conservation Manager; OHS Officer; Catchment Manager.		Years 1-10	Fire Management Policy; OHS Policy; Provincial Disaster Plan.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 834 666

6.11	SOCIO-ECONOMIC FRAMEWORK				
Objective 5 **Objective 6**	To create environmental awareness. To promote the sustainable utilization of natural resources.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• Create access to the conservation economy through the implementation and management of appropriate initiatives and projects.	• Create jobs through a range of projects (*e.g.* alien vegetation clearing, infrastructure maintenance). • Staff support through appointment of Full Time Employees. • Complete reporting on EPWP database monthly.	Conservation Manager; Community Conservation Manager; Protected Areas Manager; Tourism Manager.	Number of EPWP job opportunities (n). Number of EPWP full time equivalents (n). Number of people directly benefitting from Sustainable Livelihood Programmes (n) Number of work opportunities created (n).	Years 1-10	ICM Procedures; Public Finance Management Act (PFMA); BMS.
• The ANR&WHS provides community development opportunities through various capacity building interventions, linked to job creation opportunities.	• Assist with training and capacity building initiatives in the communities (Small, Medium and Macro Enterprises (SMME) and WIL students).	Conservation Manager; Community Conservation Manager.		Years 1-10	People and Parks Action Plan; CapeNature Communications Policy; The Development of Educational Resources (Corporate Strategic Plan); Youth Development & Environmental Education Programme Strategic Plan; BMS.
• The ANR&WHS has spiritual or religious significance.	• Access to the ANR&WHS for spiritual, cultural and traditional purposes will be allowed subject to permit conditions and with prior approval.	Conservation Manager; Community Conservation Manager.	Number of persons accessing CapeNature protected areas for cultural, traditional, spiritual, and sustainable harvesting activities (n).	Years 1-10	People and Parks Action Plan.
• Ensure awareness raising initiatives elevate awareness around conservation issues in the ANR&WHS.	• Compile information and material on ANR&WHS for dissemination and presentation on Environmental Awareness calendar days (*e.g.* Heritage day and Arbour day). • Collaborate with partners to arrange events on Environmental Awareness days and scheduled school activities, *i.e.* youth camps. • Ensure group sizes are within manageable limits of reserve. • Facilitate production of media releases. • Present talks, presentations when requested. • Assist with planning and implementation of awareness raising events. • Submit an article on the ANR&WHS for publication to a popular conservation themed magazine annually.	Conservation Manager; Community Conservation Manager; Senior Manager: Communications and Marketing.	Number of learners provided with Environmental education opportunities as per annual APO targets. Awareness raising material compiled. Articles published.	Years 1-10	People and Parks Action Plan; CapeNature Communications Policy; The Development of Educational Resources (Corporate Strategic Plan); Youth Development & Environmental Education Programme Strategic Plan.

Key Deliverables	Management/Monitoring Activities	Responsibility	Indicators	Timeframe	Existing Procedures
	• Create an enabling environment to accommodate students, researchers and volunteers to contribute to projects on the ANR&WHS.				
• Environmental education is provided to promote an understanding of biodiversity and the use of the natural environment as a vehicle for learning and development.	• Formal and informal environmental education programmes conducted on the ANR&WHS, depending on capacity. • Initiate the development of an education and awareness plan linked to the objectives of ANR&WHS. • Management will strive to raise the profile of the WHS and GCBR through linked awareness and education programmes.	Community Conservation Manager; Conservation Manager.		Years 1-10	People and Parks Action Plan; CapeNature Communications Policy; The Development of Educational Resources (Corporate Strategic Plan); Youth Development & Environmental Education Programme Strategic Plan.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 278 222

6.12	MANAGEMENT EFFECTIVENESS				
Objective 2	To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• Implement and maintain the Management Effectiveness Tracking Tool for South Africa (METT-SA)	• Conduct METT-SA assessments every second year. • Monitor and improve METT-SA Score through the development of action plans and implementation thereof. • Report to DEA as per requirement for national evaluation of METT-SA scores.	Conservation Manager; Ecological Co-ordinator; Regional Ecologist; Protected Areas Manager.	A METT-SA score of above 70% is obtained. Required METT-SA reporting done. METT-SA action plans compiled.	Every 2nd year	METT-SA Version 3 template and SOG.
• Auditing systems inform management.	• Conduct CapeNature integrated auditing system. • Compile action lists to address audit issues. • Track action list for progress. • Apply adaptive management strategies.	Conservation Manager; Ecological Co-ordinator; Regional Ecologist; Protected Areas Manager.		Once every 3 years	CapeNature integrated auditing system.
• Progress reports are compiled.	• Compile quarterly BMS progress reports. • Progress reports as required for EPWP.	Conservation Manager.		Years 1-10	BMS; EPWP reporting system.
• Implement and review the management plan for the ANR&WHS.	• Assess all management plan audit results and ensure adaptive management strategies are implemented. • Assessment on progress of management plan actions every second year. • Compile annual report on the status of implementation of the management plan and submit to the Member of Executive Council. • Complete review of management plan.	Reserve Management Committee.		Years 1-10	Protected Area Management Plan document; Standard Operating Procedures.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 556 444

6.13.1	FINANCE AND ADMINISTRATION MANAGEMENT				
Objective 2	To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• To ensure financial accountability in terms of the PFMA and the Treasury Regulations.	• Participate in an annual internal audit of the nature reserve financial records. • External audit report with findings and recommendations communicated. • Provide relevant financial information to reserve management. • An operational budget is allocated to fund the critical management needs of the nature reserve. • Manage cash flow. • Implement Supply Chain Management (SCM). • Provide input to relevant SCM reports. • Financial management practice enables efficient and effective protected area management. • Monthly variance reports submitted to reserve management. • Acknowledgement of report by Conservation Manager. • Variance report signed and returned. • Reserve management provide input to monthly cash flow forecast. • Signed and approved budget provided by 1 April.	Finance Manager; Finance and Admin Officer; Conservation Manager.	Percentage increase shown on revenue. Annual increase in visitor numbers (bookings through Central Reservations System).	Years 1-10	Budgeting process; APO; SAP system; Supply Chain Management Act; Statements of Generally Recognised Accounting Practices (GRAP).
• Identify opportunities that are robust to create a diverse income base.	• Identify sources of potential income. • Maintain new and existing partnerships with external funders / stakeholders.	Conservation Manager; Protected Areas Manager; Executive Director: Business Development.	Fixed asset register updated annually and maintained.	Years 1-10	National Treasury Regulations with regard to Donations, Sponsorships.
• Fixed Asset Management	• To manage the assets of the reserve in accordance with the relevant legislation. • To ensure that all reserve assets are bar coded. • To ensure that all reserve assets are verified twice a year. • To provide input into U-AMP annually.	Finance and Admin Manager; Finance and Admin Officer; Conservation Manager.		Bi-annually / monthly	Standard Operation Procedures (SOPs) and policies; Statement of GRAP; U-AMP guidelines.

Key Deliverables	Management/Monitoring Activities	Responsibility	Indicators	Timeframe	Existing Procedures
	• Fixed asset register is approved by the conservation manager. • Verification report is approved by the conservation manager. • Disposal of assets in line with policies. • Government Immovable Asset Management Act requirement is met annually. • Trip authorisation forms in place. • To manage CapeNature and Government Motor Transport assets in accordance with policy.				
• Capacity building among staff.	• Provide relevant financial and administrative training to reserve staff.	Conservation Manager; Finance and Admin Manager.		Years 1-10	SOPs and policies; PFMA.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 556 444

6.13.2	HUMAN RESOURCE MANAGEMENT				
Objective 2	To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Reference to Existing Procedures**
• Ensure an adequately resourced staff complement on the reserve.	• Ensure current posts are filled and appointment of additional staff (subject to funding). • Ensure resourced (tools and skills) staff in line with approved budget to manage the WHS effectively (subject to funding). • Prioritise all critical posts for filling and develop a phased implementation plan in line with approved personnel budget. • Employment relationship is in line with employment contract commitments.	Conservation Manager; Protected Areas Manager; Regional Manager; Executive Director: Conservation Management; Executive Director: Human Resources Management.	Human resource capacity is adequate to manage the protected area effectively subject to funding.	Years 1-10	Recruitment and Selection Policy; Standard Operating Procedures for Recruitment and Selection; Constitution of SA; Labour Relations Act; Basic Conditions of Employment Act; Employment Equity Act; OHSA; Overtime Policy; Equate System for Job Evaluation; Leave Policy.
• Integrate and align organisational and employee performance.	• Implement effective Performance Management System. • Ensure compliance with Code of Conduct.	Conservation Manager; Protected Areas Manager; Executive Director: Conservation Management; Executive Director: Human Resources Management; CEO.	Performance agreements completed and signed for all employees. Performance appraisals completed for all employees.	Years 1-10	Performance Management Handbook; Annual Plan of Operations; Rewards Foundation Policy; Disciplinary Code and Procedures; Managing poor performance; Code of Conduct.
• Skilled employees on ANR&WHS.	• All staff is skilled to perform according to job specification in the roles they occupy in line with mandatory legislative requirements. • Develop personal development plan for all staff on ANR&WHS. • Roll out of personal development plan for all staff on ANR&WHS. • Reflect capacity development interventions which are supported by mentorship and coaching agreements. • Conduct annual skills audit.	Conservation manager; Protected Areas Manager; Human Resources, Employment Equity and Training Committees.	Personal development plan for all staff on the reserve developed. Mentorship and coaching agreements in place. Implement skills plan according to priorities and budget availability.	Years 1-10	Individual Personal Development Plans; Mentorship strategy and toolbox; Skills Development Act; Training Policy; Bursary Policy; Internship Policy.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 1 391 110

6.13.3	OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT				
Objective 2	To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• To implement policies, procedures and systems to ensure compliance to the OHSA.	• Implement Occupational Health and Safety (OHS) System. • Conduct monthly Health and Safety inspections. • Conduct monthly Health and Safety meetings.	Regional Manager; Protected Areas Manager; Conservation Manager; OHS Officer.	No disabling injuries occur.	Years 1-10	OHSA; Internal Health and Safety System.
• To inform the workers, contractors, volunteers, students and the public of these dangers, how exposure could be prevented, and how to work safely.	• Attend accredited OHS training: Hazard Identification Risk Assessment (HIRA). • Attend accredited OHS training to renew certificates (OHS Reps & First Aid Officers). • Attend in-house OHS training workshops. • Conduct monthly toolbox talks.	Regional Manager; Protected Areas Manager; Conservation Manager; OHSA Reps; Operators of equipment and machinery; First Aid Officers; Designated OHSA risk specific appointments; OHS Officer.		Years 1-10	OHS Training Needs Analysis (conducted annually and aligned with available legislative requirements and available resources).
• HIRA, Risk Management and Risk Control are implemented on the ANR&WHS.	• Conduct regular HIRA processes to determine key risks with highest impact potential. • Recommend remedial action plans to address key risks. • Follow-up to ensure effective implementation.	Regional Manager; Protected Areas Manager; Conservation Manager; OHS Officer.		Years 1-10	HIRA Report; Safe Operating Procedure.
• Monitor and review to ensure adaptive management strategies are applied to improve health and safety on the ANR&WHS.	• Assist in conducting of internal audit process to determine effectiveness and level of compliance of implementation of OHS Management Control System.	Conservation Manager; OHS Officer.		Years 1-10	Worksite Audit Report.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 556 444

6.14	VISITOR MANAGEMENT AND SERVICES				
Objective 2	To manage the conservation estate effectively.				
Key Deliverables	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• To plan for and manage visitor facilities.	• Monitor and manage visitor numbers and their environmental impact. • Plan for and develop visitor facilities within CDF and local area plans. • Survey visitor opinions. • Ensure tourism facilities are accessible for disabled persons (where desirable).	Tourism Manager; Tourism Officer; Conservation Manager; Director: Marketing & Eco-tourism.	Annual increase in visitor numbers. Annual increase in tourism income.	Years 1-10	SDF; Strategic Development Plan.
• To strive to ensure visitor safety.	• Establish collaborative relationships with policing authorities. • Liaise with local authorities and stakeholders on security issues.	Tourism Manager; Tourism Officer; Conservation Manager.		Years 1-10	Strategic Development Plan.
• To promote and manage access to ANR&WHS.	• Provide access to all visitors. • Set management guidelines for different use zones. • Implement the Wild Card system and provide discounted rates to specific user groups. • Monitor pay access points and control access where required. • Identify areas requiring special management strategies and protection from visitor use. • Facilitate access for disadvantaged groups on request.	Tourism Manager; Tourism Officer; Conservation Manager.		Years 1-10	Strategic Development Plan; PMFA.

Budget Allocation	**Development**	R 0
	Operation (10 Year Forecast)	R 2 225 776

6.15	TOURISM DEVELOPMENT FRAMEWORK				
Objective 5 **Objective 6**	To create environmental awareness. To promote the sustainable utilization of natural resources.				
Action plans	**Management/Monitoring Activities**	**Responsibility**	**Indicators**	**Timeframe**	**Existing Procedures**
• To provide nature and cultural tourism and recreational opportunities within ANR&WHS without affecting the ecological processes negatively.	• Prioritise different types of tourism development within the ANR&WHS according to the CDF. • Implement business plan. • Conduct infrastructure and visitor monitoring to inform mitigation where necessary.	Tourism Manager; Conservation Manager; Community Conservation Manager.	Concession of selected tourism opportunities Minimum standards adhered to as set by CapeNature management. Regular audits to be done on the tourism facilities on site. Development priorities in place and implemented in the correct zones within the WHS. Recommendations within these plans implemented. Concessionaire compliance audited.	Years 1-10	CDF; Strategic Development Plan.
• Promote Community-Based Tourism and SMME initiatives in and around ANR&WHS.	• Investigate possibilities for private / community sector involvement in the planning, design, financing and / or running of community based tourist facilities.	Tourism Manager; Conservation Manager; Community Conservation Manager.	Successful operation (stable tourist flow and financial success) of SMMEs and community-based tourist facilities.	Years 1-10	CDF; Strategic Development Plan.
• Ensure tourism contributes to conservation through ANR&WHS.	• Monitor tourist use and interest within the reserve, including negative impacts and adapt where necessary. • Establish a financial management system for ANR&WHS. • Ensure proper control of the WHS's assets. • Identify the potential for negative consequences and their adverse effects on tourism (risk assessment).	Conservation Manager.	Tourist use monitoring programme in place. Management systems (financial, risk and asset register) are in place and implemented.	Years 1-10	

Budget Allocation	**Development**	R 1 800 000
	Operation (10 Year Forecast)	R 278 222

7) REFERENCES

ALMOND, J. & BROWNING, C. 2015. CapeNature Anysberg Nature Reserve – Geology & Fossils, 21 pp. Natura Viva cc, Cape Town & Council for Geoscience, Bellville.

ANDERSON, N., SCHULTZE, E., CODRON, D., BISSETT, C., GAYLARD, A. & CHILD, M.F. 2016. A conservation assessment of *Antidorcas marsupialis*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

BATES, M.F., BRANCH, W.R., BAUER, A.M., BURGER, M., MARAIS, J., ALEXANDER, G.J. & DE VILLIERS, M.S. eds. 2014. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. South African National Biodiversity Institute, Pretoria.

BIRP. 2015. Animal Demography Unit, Department of Biological Science, University of Cape Town. http://birp.adu.org.za. Downloaded on 26 Sept 2017.

BIRSS, C. 2017. Mammals. In: Western Cape Province State of Biodiversity 2017, ed. Turner, A.A., CapeNature, Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3.

BIRSS, C. & PALMER, N.G. 2012. Mammals. In: Western Cape Province State of Biodiversity 2012, ed. Turner, A.A., CapeNature, Scientific Services, Stellenbosch. ISBN: 978-0-621-41407-03.

BIRSS, C., PEEL, M., POWER, R.J. & RELTON, R. 2016a. A conservation assessment of *Oreotragus oreotragus*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

BIRSS, C., RELTON, C. & SELIER, S.A.J. 2016b. A conservation assessment of *Sylvicapra grimmia*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

BIRSS, C., COWELL, C., HAYWARD, N., PEINKE, D., HRABAR, H.H & KOTZE, A. 2016c. Biodiversity Management Plan for the Cape mountain zebra in South Africa. Jointly developed by CapeNature, South African National Parks, Eastern Cape Parks and Tourism Agency, National Zoological Gardens, Department of Environmental Affairs, Northern Cape Department of Environment and Nature Conservation, Eastern Cape Department of Economic Development, Environmental Affairs and Tourism and Free State Department of Economic, Small business, Tourism and Environmental Affairs. Version 1.0

BUIJS, D., VENTER, J., PARRINI, F. & RELTON, C. 2016. A conservation assessment of *Tragelaphus oryx*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

BUSSIÈRE, E. & UNDERHILL, L. 2016. Camera Trap Survey in the Little Karoo. University of Cape Town, 7700 Rondebosch, South Africa.

CAMBRAY, J. 2007. *Barbus anoplus*. The IUCN Red List of Threatened Species 2007. http://dx.doi.org/10.2305/IUCN.UK.2007.RLTS.T63249A12645306.en. Downloaded on 06 November 2017.

CAPENATURE. 2009. People and Parks Programme in CapeNature. Unpublished Report, Cape Town.

CAPENATURE. 2016a. Invasive alien species monitoring, control and eradication plan for Anysberg Nature Reserve and World Heritage Site. Unpublished internal report, Western Cape Nature Conservation Board, Cape Town.

CAPENATURE. 2016b. Veldfire management policy. Version 6. Unpublished internal policy, Western Cape Nature Conservation Board, Cape Town.

CAPENATURE. 2016c. Veldfire management guidelines. Unpublished internal report, Western Cape Nature Conservation Board, Cape Town.

CAPENATURE. 2017. Business plan for Anysberg Nature Reserve and World Heritage Site, CapeNature. Unpublished internal report, CapeNature, Cape Town.

CHAKONA, A., SWARTZ, E.R, & GOUWS, G. 2013. Evolutionary drivers of diversification and distribution of a southern temperate stream fish assemblage: testing the role of historical isolation and spatial range expansion. PLoS ONE 8(8): e70953.

CHILD, M.F., ROXBURGH, L., DO LINH SAN, E., RAIMONDO, D. & DAVIES-MOSTERT, H.T. eds 2016a. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

CHILD, M.F., ROWE-ROWE, D., BIRSS, C., WILSON, B., PALMER, G., STUART, C., STUART, M., WEST, S. & DO LINH SAN, E. 2016b. A conservation assessment of *Poecilogale albinucha*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

CNdV AFRICA (PTY) LTD. 2012. Laingsburg Municipal Spatial Development Framework Draft final Report. Prepared for Laingsburg Municipality and Provincial Government of the Western Cape.

CNdV AFRICA (PTY) LTD. 2013. Kannaland Municipality, Final Spatial Development Framework. Prepared for Kannaland Municipality and Provincial Government of the Western Cape.

CNdV AFRICA (PTY) LTD. 2016. Langeberg Municipality Spatial Development Framework (13.2238).

COETZEE, K. 1994. The Riverine Rabbit (*Bunolagus monticularis*) and its habitat - Conservation implications of an unnaturally fragmented distribution. M. Tech. Diploma. Port Elizabeth Technicon. South Africa.

COLLINS, K. & DU TOIT, J.T. 2016. Population status and distribution modelling of the critically endangered riverine rabbit (*Bunolagus monticularis*). African Journal of Ecology. John Wiley & Sons (Ltd). Pp 1-12. DOI: 10.1111/aje.12285.

COLLINS, K., BRAGG, C., BIRSS, C. & CHILD, M.F. 2016. A conservation assessment of *Bunolagus monticularis*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

COOMBES, P.J. & MENTIS, M.T. 1992. A Procedure for Defining Conservation Management Objectives and Goals. TPA. Nature and Environmental Conservation, Pretoria.

COUNCIL FOR GEOSCIENCE. 2004. Ladismith 3320, 1: 250 000 Geological Map, Digital data.

COWAN, G.I. & MPONGOMA, N. 2010. Guidelines for the development of a management plan for a protected area in terms of the National Environmental Management: Protected Areas Act, 2003. Department of Environment Affairs, Pretoria, unpublished.

CSIRO MARINE AND ATMOSPHERIC RESEARCH. 2012. Management Strategy Evaluation. http://www.cmar.csiro.au/research/mse/. Downloaded on 18 October 2012.

DAVIES, D.M. 1988a. Leafhoppers (Homoptera: Cicadellidae) associated with the Restionaceae. The tribe Cephalelini (Ulipinae). Journal of the Entomological Society of South Africa 51: 31–64.

DAVIES, D.M. 1988b. Leafhoppers (Homoptera: Cicadellidae) associated with the Restionaceae. II. The tribes Athysanini and Paralimini (Enscelinae). Journal of the Entomological Society of South Africa 51: 65–80.

DE BEER, C.H. 2002. The stratigraphy, lithology and structure of the Table Mountain Group. In: A synthesis of the Hydrogeology of the Table Mountain Group – Formation of a research strategy, eds Petersen, K. & Parsons, R. WRC report: TT 158/01.

DEPARTMENT OF WATER AFFAIRS. 2012a. Aquifer Classification of South Africa. Remapped from Andiswa Matoti, Julian Conrad and Susan Jones, CSIR, 22 March 1999. Recompiled 2012, Hydrological Services, Groundwater Information.

DEPARTMENT OF WATER AFFAIRS. 2012b. Groundwater Quality of South Africa. Remapped from Andiswa Matoti, Julian Conrad and Susan Jones, CSIR, 22 March 1999. Recompiled 2012, Hydrological Services, Groundwater Information.

DEPARTMENT OF WATER AFFAIRS. 2013a. Aquifer vulnerability of South Africa. Remapped from Andiswa Matoti, Julian Conrad and Susan Jones, CSIR, 22 March 1999. Recompiled 2013, Hydrological Services, Groundwater Information.

DEPARTMENT OF WATER AFFAIRS. 2013b. Aquifer Susceptibility of South Africa. Remapped from Andiswa Matoti, Julian Conrad and Susan Jones, CSIR, 22 March 1999. Recompiled 2013, Hydrological Services, Groundwater Information.

DESMET, P., HELME, N. & WILSON, N. 2012. A Review of the Leslie Hill Succulent Karoo Trust's Investment Priorities. Leslie Hill Succulent Karoo Trust, WWF-SA, Cape Town. November 2012. 24 pp.

DOWNS, C.T., COATES, G. & CHILD, M.F. 2016. A conservation assessment of *Tragelaphus sylvaticus*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

DUTHIE, G. SKINNER, J.D. & ROBINSON, T.J. 1989. The Distribution and Status of the Riverine Rabbit, *Bunolagus monticularis*, South Africa. Biological Conservation (47): 195-202.

ELLENDER, B.R., WASSERMAN, R.J., CHAKONA, A., SKELTON, P.H. & WEYL, O.L.F. 2017. A review of the biology and status of Cape Fold Ecoregion freshwater fishes. Aquatic Conservation: Marine and Freshwater Ecosystems. doi: 10.1002/aqc.2730.

ELLENDER, B.R & WEYL, O.L.F. 2014. A review of current knowledge, risk and ecological impacts associated with non-native freshwater fish introductions in South Africa. Aquatic Invasions. 9: 117–132.

ESLER, K.J., PIERCE, S. & DE VILLIERS, C. 2014. Fynbos ecology and management. Briza, Pretoria.

GELDERBLOM C. 2006. What attracts tourists to the Little Karoo? Technical Report produced as part of Klein Karoo Study Group. Stellenbosch.

GORDAN, E. 2009. Business plan for the Anysberg Nature Reserve. Casidra Pty (Ltd.).

GOURITZ CLUSTER BIOSPHERE RESERVE. 2016. Our strategy: The organisation in a nutshell. http://www.gouritz.com/our-strategy/. Accessed on 21 September 2017.

GOLDBLATT, P. 1978. An analysis of the flora of Southern Africa: Its characteristics, relationships and origins. Annals of Missouri Botanical Garden 65: 369-436.

HENDERSON, L. 2001. Alien weeds and invasive plants – A complete guide to declared weeds and invaders in South Africa. Plant Protection Research Institute Handbook No. 12, Agricultural Research Council, Cape Town.

HENNING, G.A., TERBLANCHE, R.F., & BALLl, J.B. 2009. South African Red Data Book: butterflies. South African National Biodiversity Institute, Pretoria

HOFFMAN, T., BEAMISH, E., KAPLAN, B., LEWIS, M., O'RIAIN, M.J., SITHALDEEN, R. & STONE, O. 2016. A conservation assessment of *Papio ursinus*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D.,

Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

HRABAR, H., BIRSS, C., PEINKE, D., KING, S., NOVELLIE, P., KERLEY, G. & CHILD, M.F. 2016. A conservation assessment of *Equus zebra zebra*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

IMPSON, D., VAN DER WALT, R. & JORDAAN, M.S. 2017. Freshwater fishes. In: Western Cape Province State of Biodiversity 2017, ed. Turner, A.A., CapeNature, Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3.

IUCN. 2001. IUCN Red List of Threatened Species. Version 3.1. www.iucnredlist.org. Downloaded on 27 October 2017.

IUCN. 2011. IUCN Red List of Threatened Species. Version 2011.2. www.iucnredlist.org. Downloaded in October 2017.

IUCN. 2013. IUCN Red List of Threatened Species. Version 2013 .2. www.iucnredlist.org. Downloaded in October 2016.

JACOBS, D., COHEN, L., RICHARDS, L.R., MONADJEM, A., SCHOEMAN, C., MACEWAN, K., SETHUSA, T. & TAYLOR, P.J. 2016. A conservation assessment of *Rhinolophus clivosus*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

JACOBS, L.E.O., KOOPMAN, R., SCHUTTE-VLOK, A. & FORSYTH, T. 2017. Plants and vegetation. In: Western Cape Province State of Biodiversity 2017, ed. Turner, A.A., CapeNature, Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3.

JORDAAN, M.S. & GOUWS, J. 2015. Scientific Services Field Report: Anysberg Nature Reserve fish and river survey. Unpublished internal CapeNature report.

JORDAAN, M.S., IMPSON, D., & VAN DER WALT, R. 2012. Freshwater fishes. In: Western Cape State of Biodiversity 2012, ed. Turner, A.A., CapeNature Scientific Services, Stellenbosch, South Africa.

LYLE, R. & DIPPENAAR-SCHOEMAN, A.S. 2015. Red Listing of South African Spiders. SANSA Newsletter 23: 1.

MANNING, J. & GOLDBLATT, P. eds. 2012. Plants of the Greater Cape Floristic Region 1: The Core Cape Flora. Strelitzia 29. South African National Biodiversity Institute, Pretoria.

MAREE, K.S., PENCE, G.Q.K. & PURNELL, K. 2015. Western Cape Protected Area Expansion Strategy: 2015 – 2020. Unpublished internal report, CapeNature. Cape Town.

MARTIN, R., MARTIN, J., MARTIN, E. & PEPLER, D. 1989. Anysberg Nature Reserve: a new Reserve for the Cape. Birding in South Africa 41(4): 99-102.

MINNIE, L., AVENANT, N.L., KAMLER, J., BUTLER, H., PARKER, D., DROUILLY, M., DU PLESSIS, J. & DO LINH SAN, E. 2016. A conservation assessment of *Canis mesomelas.* In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

MINTER, L.R., BURGER, M., HARRISON, J.A., BRAACK, H.H., BISHOP, P.J. & KLOEPFER, D. 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. Animal Demography Unit. Department of Zoology, University of Cape Town.

MONADJEM, A., JACOBS, D., COHEN, L., MACEWAN, K., RICHARDS, L.R., SCHOEMAN, C., SETHUSA, T. & TAYLOR, P.J. 2016. A conservation assessment of *Myotis tricolor*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

MOODIE, D. 1960. The Record: Or a series of official papers relative to the condition and treatment of the native tribes of South Africa 1838-1842. Part III. Facsimile reproduction. Cape Town: Balkema. (Original work published in 1838).

MOODLEY, Y. 2002. Population structuring in southern African zebras. Unpublished Ph.D. thesis, University of Cape Town. 157 pp.

MOODLEY, Y. & HARLEY, E.H. 2005. Population structuring in mountain zebra (*Equus zebra*): the molecular consequences of divergent histories. Conservation Genetics 6: 953-968.

MUCINA, L. & RUTHERFORD, M.C. eds. 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

NEL, J.L., MURRAY, K.M., MAHERRY, A.M., PETERSEN, C.P., ROUX, D.J., DRIVER, A., HILL, L., VAN DEVENTER, H., FUNKE, N., SWARTZ, E.R., SMITH-ADAO, L.B., MBONA, N., DOWNSBOROUGH, L., & NIENABER, S. 2011a. Technical Report: National Freshwater Ecosystem Priority Areas project. WRC Report No. 1801/2/11, WRC, Pretoria.

NEL, J.L., DRIVER, A., STRYDOM, W., MAHERRY, A., PETERSEN, C., HILL, L., ROUX, D.J., NIENABER, S., VAN DEVENTER, H., SWARTZ, E. & SMITH-ADAO, L.B. 2011b. Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources. WRC Report No.TT 500/11, Water Research Commission, Pretoria.

OKES, N., PONSONBY, D.W., ROWE-ROWE, D., AVENANT, N.L. & SOMERS, M.J. 2016. A conservation assessment of *Aonyx capensis*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

OLLIS, D.J., SNADDON, C.D., JOB, N. & MBONA, N. (2013). Classification System for wetlands and aquatic ecosystems in South Africa. User manual: Inland Systems. SANBI Biodiversity Series 22. South African National Biodiversity Institute, Pretoria.

PALMER, G., BIRSS, C. & DU TOIT, J.T. 2016. A conservation assessment of *Raphicerus campestris*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

PARRINI, F. & CHILD, M.F. 2016. A conservation assessment of *Tragelaphus strepsiceros*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

PENCE, G.Q.K. 2014. Western Cape Biodiversity Framework 2014 Status Update: Critical Biodiversity Areas of the Western Cape. Unpublished CapeNature project report. Cape Town, South Africa.

PRICE-WATERHOUSE-COOPERS. 2012. Kannaland Integrated Development Plan 2012/13 to 2015/17.

RAIMONDO, D., VON STADEN, L., FODEN, W., VICTOR, J.E., HELME, N.A., TURNER, R.C., KAMUNDI, D.A. & MANYAMA, P.A. eds. 2009. Red List of South African plants 2009. Strelitzia 25. South African National Biodiversity Institute, Pretoria.

REYERS, B. & VLOK, J. 2008. Unpublished methods, data, and results for determining the representation targets of the Klein Karoo. Stellenbosch.

REYERS B., O'FARRELL P.J., COWLING R.M., EGOH B.N., LE MAITRE D.C. & VLOK J.H.J. 2009. Ecosystem services, land-cover change, and stakeholders: finding a sustainable foothold for a semiarid biodiversity hotspot. Ecology and Society 14: 38. [online] URL: http://www.ecologyandsociety.org/vol14/iss1/art38/

RIVER HEALTH PROGRAMME. 2007. State of Rivers Report: Rivers of the Gouritz Water Management Area. Department of Water Affairs, Pretoria. ISBN No: 0-620-38676-0.

RUITERS, A.K., TILNEY, P.M., VAN WYK, B.-E. & MAGEE, A.R. 2016. Taxonomy of the genus *Phymaspermum* (Asteraceae, Anthemideae). Systematic Botany 41(2): 430-456.

RUST, R. 2000. The rock art of the Anysberg Nature Reserve, Western Cape: a sense of place and rainmaking. Unpublished Ph.D. thesis, University of Stellenbosch.

SABAP2. 2015. South African Bird Atlas Project 2. Anysberg coverage Pentads. Http://sabap2.adu.org.za/. Downloaded on 26 September 2017.

SAMWAYS, M.J. 2002. A strategy for the national red-listing of invertebrates based on experiences with Odonata in South Africa. African Entomology 10:43–52

SAMWAYS, M.J., HAMER, M. & VELDTMAN, R. 2012. Development and future of insect conservation in South Africa. Pp. 245-278. In: Insect Conservation: Past, Present and Prospects, ed. New, T.R., Springer, Dordrecht.

SANBI & DEA. 2010. National protected areas expansion strategy for South Africa; Priorities for expanding the protected area network for ecological sustainability and climate change

adaptation. Published by the government of South Africa, Pretoria. ISBN 978-1-919976-55-6.

SCHUTTE-VLOK, A. 2015. ANYSBERG NATURE RESERVE AND WORLD HERITAGE SITE: Habitat assessment of Touwsfontein area for introduction of Cape mountain zebra. Unpublished internal CapeNature report.

SHAW, K.A. & WALLER, L.J. 2017. Avifauna. In: Western Cape Province State of Biodiversity 2017, ed. Turner, A.A., CapeNature, Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3.

SKELTON, P.H. 2001. A complete guide to the freshwater fishes of Southern Africa. Struik Publishers, Cape Town.

SKELTON, P.H. 2016. Name changes and additions to the southern African freshwater fish fauna. African Journal of Aquatic Science 41(3): 345-351.

SKELTON, P.H. & SWARTZ, E.R. 2011. Walking the tightrope: trends in African freshwater systematic ichthyology. Journal of Fish Biology 79: 1413-1435.

SKINNER, J.D. & CHIMIMBA, C.T. eds. 2005. The mammals of the Southern African Subregion. Cambridge University Press, Cape Town. South Africa.

SKOWNO, A.L., HOLNESS, S.D. & DESMET, P. 2010. Biodiversity Assessment of the Kannaland and Oudtshoorn Local Municipalities, and Eden District Management Area (Uniondale). Unpublished report for the Dept of Environmental Affairs and Development Planning LB07/2008a, Port Elizabeth.

SMITH, R.K., MARAIS, A., CHADWICK, P., LLOYD, P.H. & HILL, R.A. 2008. Monitoring and management of the endangered Cape mountain zebra *Equus zebra zebra* in the Western Cape, South Africa. African Journal of Ecology 46: 207–213.

STIRTON, C.H., MUASYA, A.M. & VLOK, J. 2012. *Psoralea karooensis* (Psoraleeae, Fabaceae): a new species from the Klein Karoo region of South Africa. PhytoKeys 17:19-23.

SWANEPOEL, L.H., BALME, G., WILLIAMS, S., POWER, R.J., SNYMAN, A., GAIGHER, I., SENEKAL, C., MARTINS, Q. & CHILD, M.F. 2016. A conservation assessment of *Panthera pardus*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

SWARTZ, E.R. 2005. Phylogeography, phylogenetics and evolution of the redfins (Teleostei, Cyprinidae, *Pseudobarbus*) in southern Africa. Unpublished Ph.D. Dissertation, University of Pretoria.

SWARTZ, E. & IMPSON, D. 2007. *Pseudobarbus asper*. The IUCN Red List of Threatened Species 2007. http://dx.doi.org/10.2305/IUCN.UK.2007.RLTS.T18477A8330018.en. Downloaded on 06 November 2017.

TAYLOR, M.R., PEACOCK, D.S. & WANLESS, R.M. eds. 2015. The Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland. Johannesburg: BirdLife South Africa.

TAYLOR, A., COWELL, C., DROUILLY, M., SCHULZE, E., AVENANT, N., BIRSS, C. & CHILD, M.F. 2016. A conservation assessment of *Pelea capreolus*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

TURNER, A.A. & DE VILLIERS, A.L. 2017. Reptiles. In: Western Cape Province State of Biodiversity 2017, ed. Turner, A.A., CapeNature, Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3.

TWEDDLE, D., BILLS, R., SWARTZ, E., COETZER, W., DA COSTA, L., ENGELBRECHT, J., CAMBRAY, J., MARSHALL, B., IMPSON, D., SKELTON, P.H., DARWALL, W.R.T. & SMITH, K.S. 2009. The status and distribution of freshwater fishes. pp. 21-37. In: The status and distribution of freshwater biodiversity in Southern Africa, eds Darwall, W.R.T., Smith, K.G., Tweddle, D. & Skelton, P.H., Gland (Switzerland) and Grahamstown (South Africa): IUCN and South African Institute for Aquatic Biodiversity.

VAN WILGEN, B.W. & FORSYTH, G.G. 2008. The historical effects and future management of fire regimes in the fynbos protected areas of the Western Cape Province. CSIR Report No. CSIR/NRE/ECO/ER/2008/0078/C.

VELDTMAN, A., DIPPENAAR-SCHOEMAN, A.S., SAMWAYS, M.J., VELDTMAN, R. & DU PLESSIS, E. 2017. Arthropods. In: Western Cape Province State of Biodiversity 2017, ed. Turner, A.A., CapeNature, Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3.

VENTER, J. & CHILD, M.F. 2016. A conservation assessment of *Alcelaphus buselaphus caama*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa

VENTER, J., EHLERS-SMITH, Y. & SEYDACK, A. 2016. A conservation assessment of *Potamochoerus larvatus*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

VLOK, J.H.J. & COETZEE, K. 2008. Ecological capacity of the Little Karoo for larger wildlife - matching game species to habitat and recommended densities. CEPF Report. http://www.gouritz.com/useful-maps/. Downloaded on 1 November 2017.

VLOK, J.H.J. & SCHUTTE-VLOK, A. 2010. Plants of the Klein Karoo. Umdaus Press, Hatfield, Pretoria.

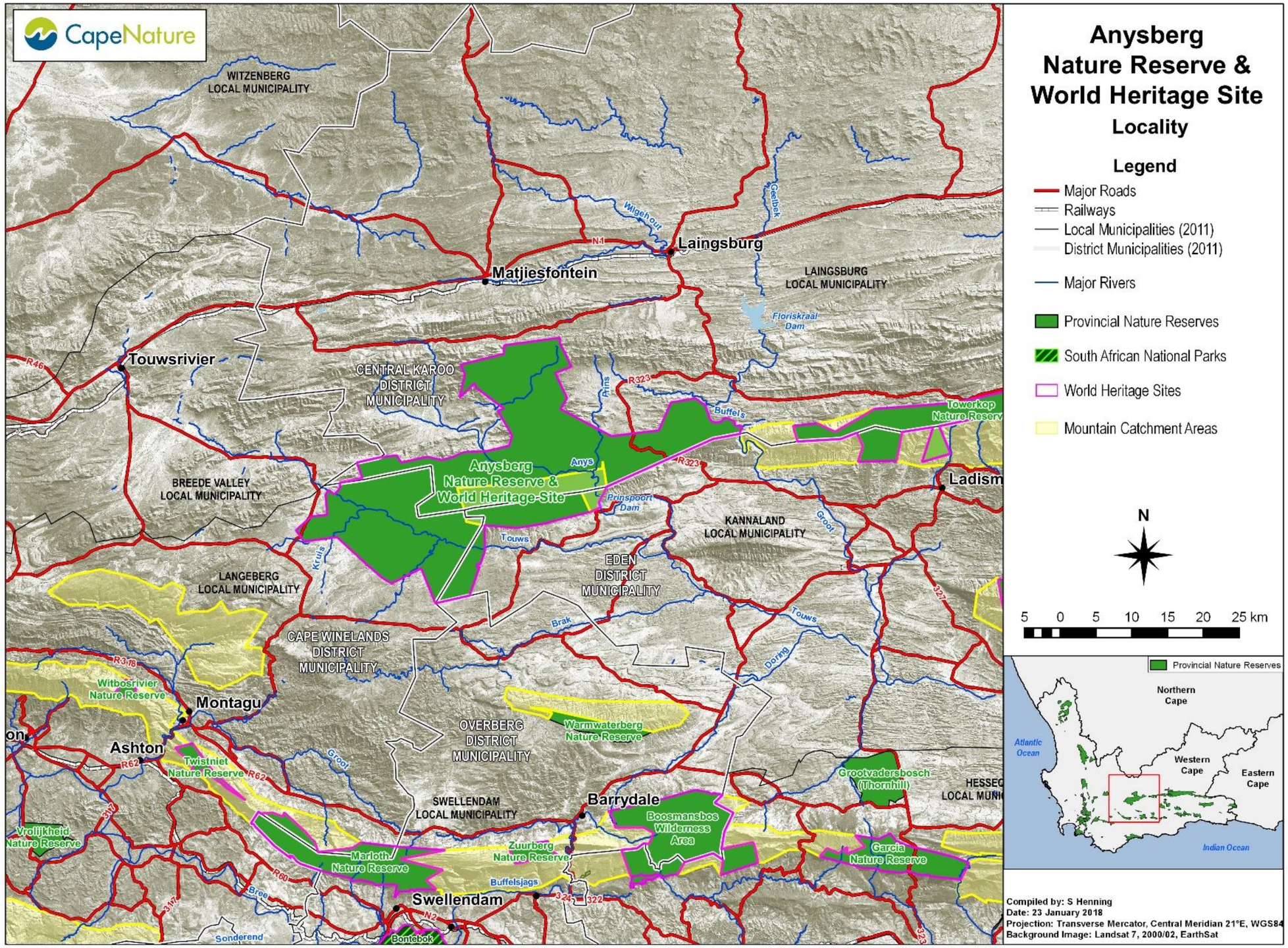
VLOK, J.H.J., WOLF, T. & COWLING, R.M. 2005. A vegetation map for the Little Karoo. Unpublished report and maps for the SKEP project supported by Grant No 1064410304. Critical Ecosystem Partnership Fund, Cape Town.

WALLER, L.J. 2011. CapeNature Protected Area Management Plan Scientific and Technical Review Guidelines.

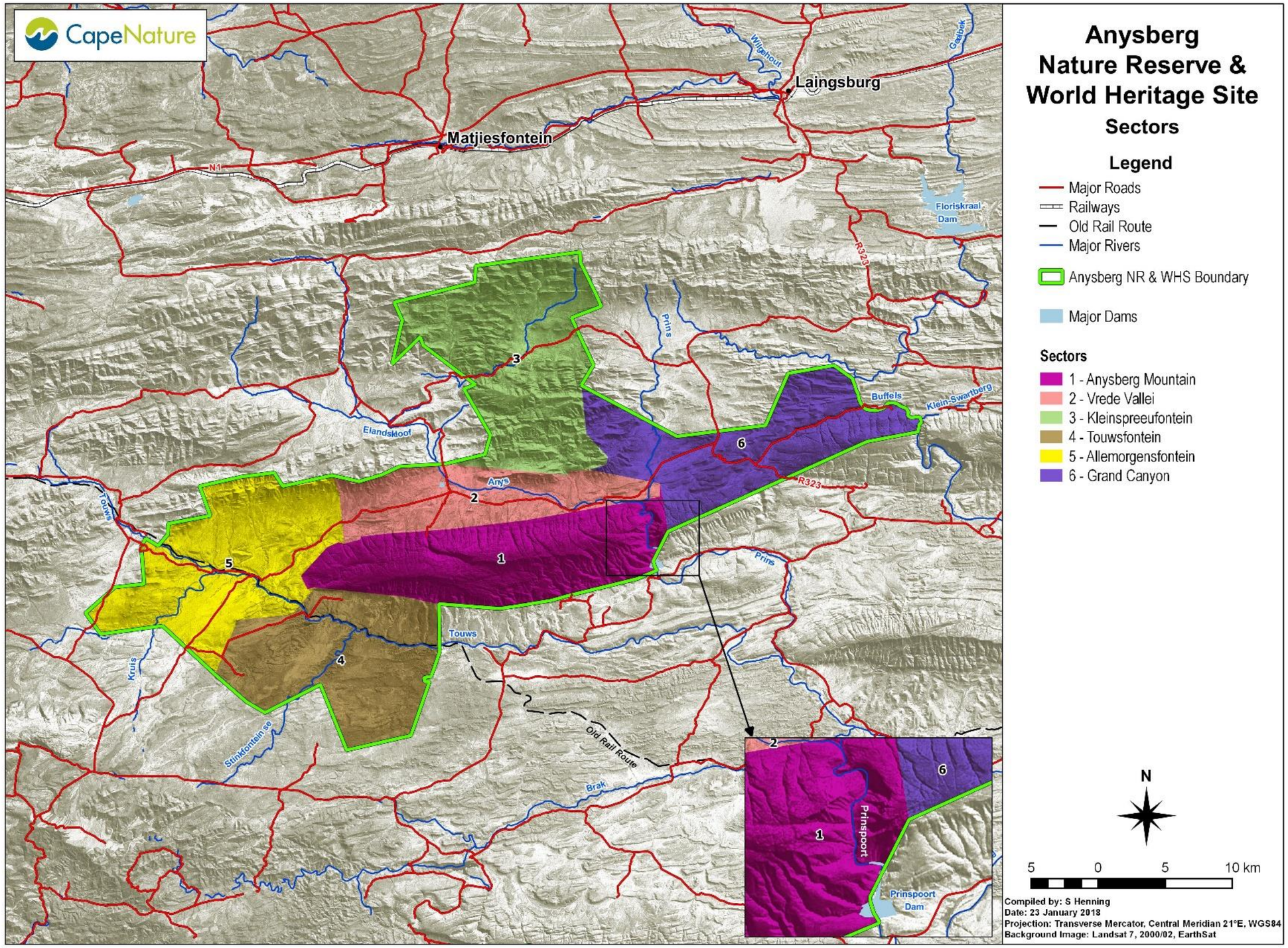
WRIGHT, M. & SAMWAYS, M.J. 1998. Insect species richness tracking plant species richness in a diverse flora: gall insects in the Cape Floristic Region, South Africa. Oecologia 115: 427-433.

YANG, L., SADO, T., HIRT, M.V., PASCO-VIEL, E., ARUNACHALAM, M., LI, J., WANG, X., FREYHOF, J., SAITOH, K., SIMONS, A.M., MIYA, M., HE, S., & MAYDEN, R.L. 2015. Phylogeny and polyploidy: Resolving the classification of cyprinine fishes (Teleostei: Cypriniformes). Molecular Phylogenetics and Evolution 85: 97-116.

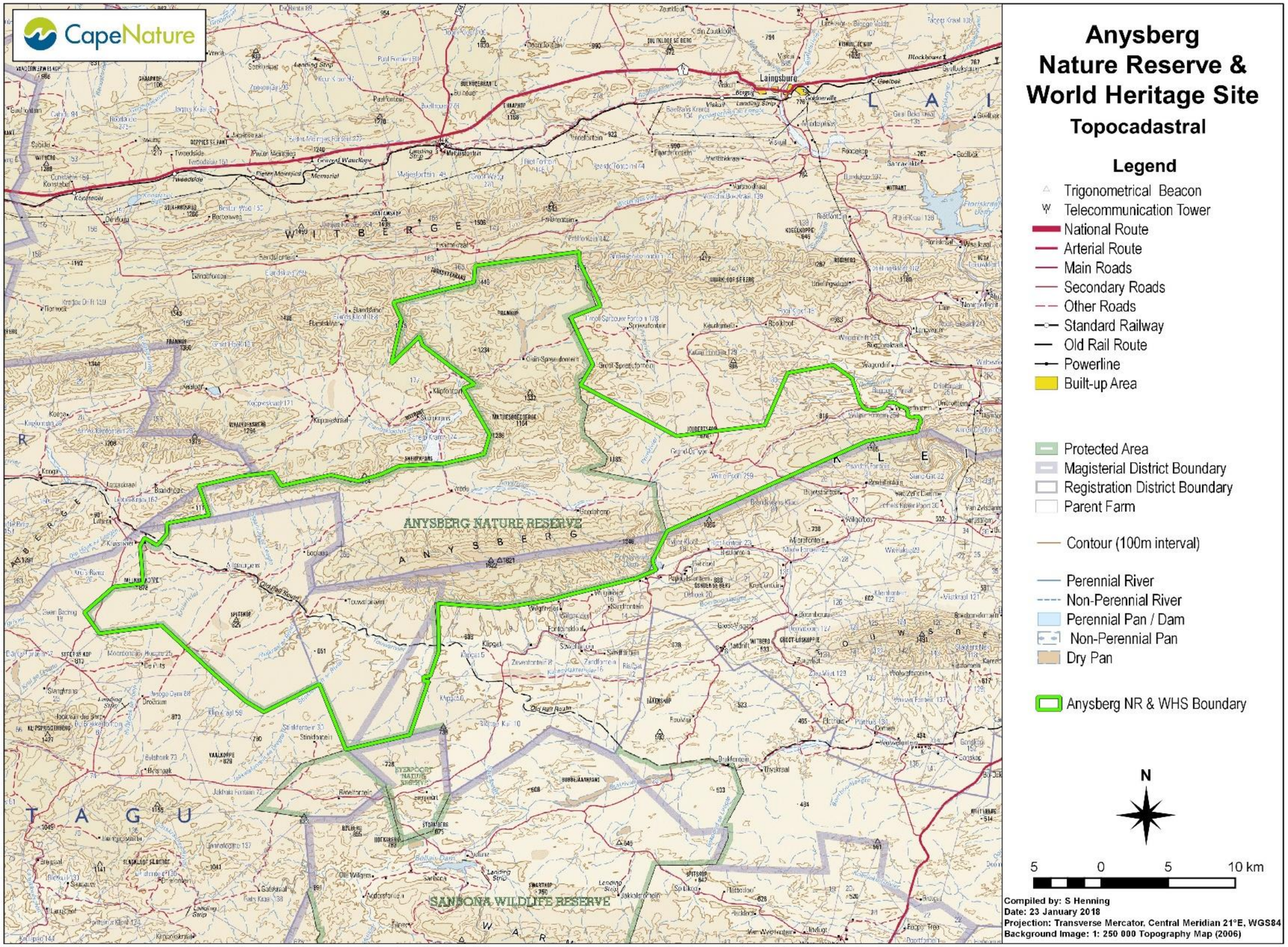
YARNELL, R.W., RICHMOND-COGGAN, L., BUSSIÈRE, E., WILLIAMS, K., BISSETT, C., WELCH, R. & WIESEL, I. 2016. A conservation assessment of *Parahyaena brunnea*. In: The Red List of Mammals of South Africa, Swaziland and Lesotho, eds Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T., South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.



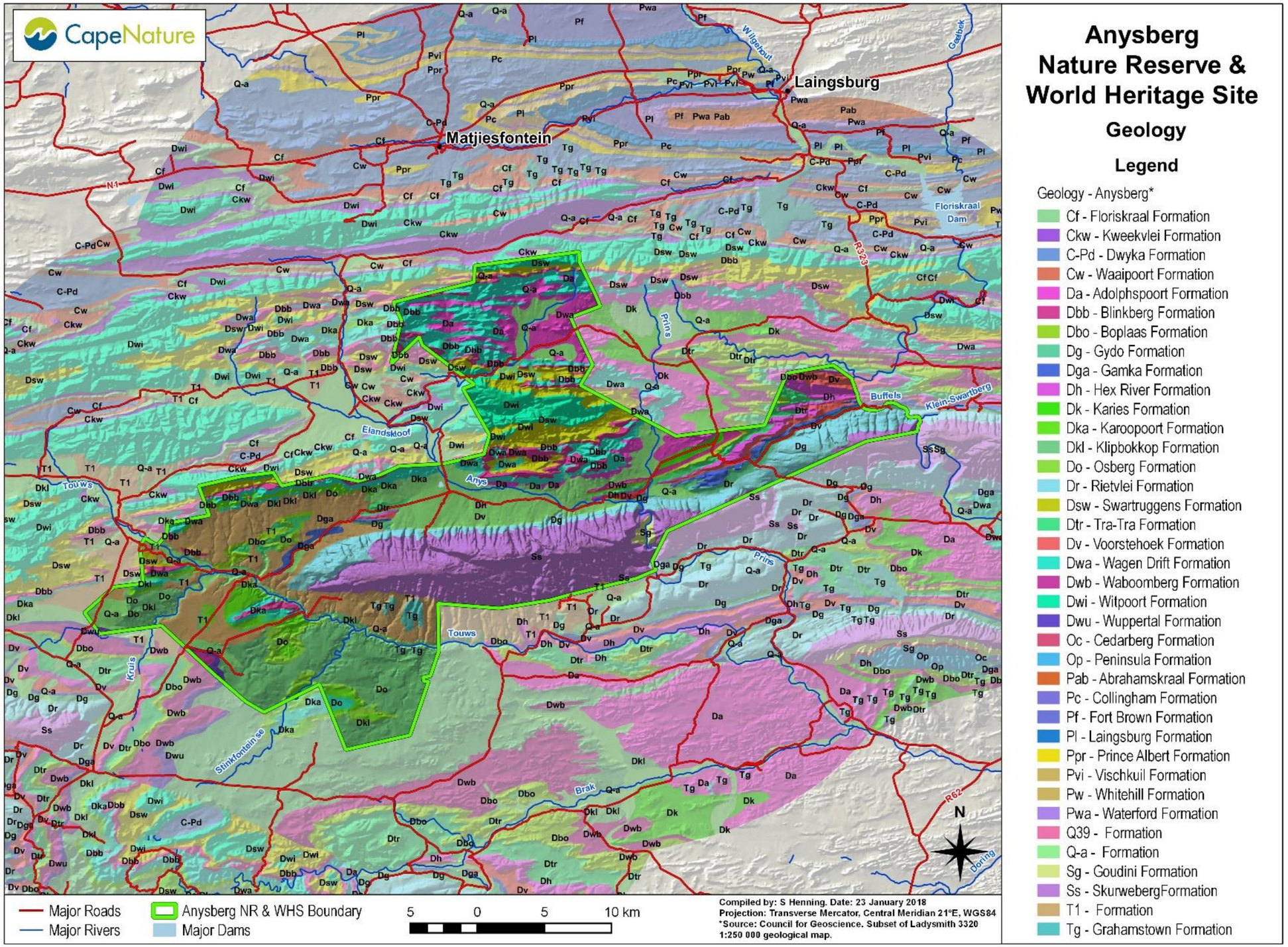
Map 1: Location and extent of Anysberg Nature Reserve and World Heritage Site.



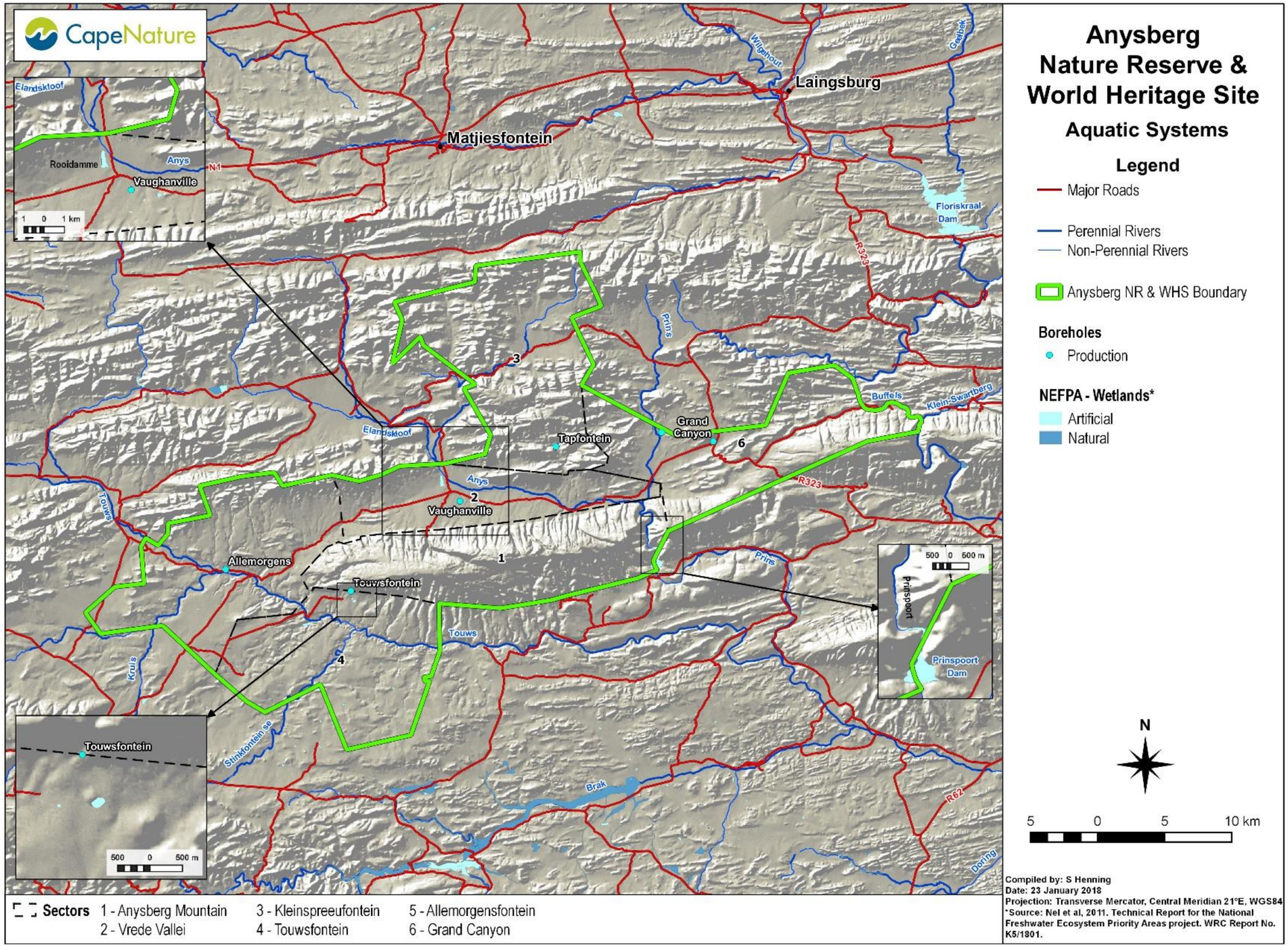
Map 2: Management sectors of Anysberg Nature Reserve and World Heritage Site.



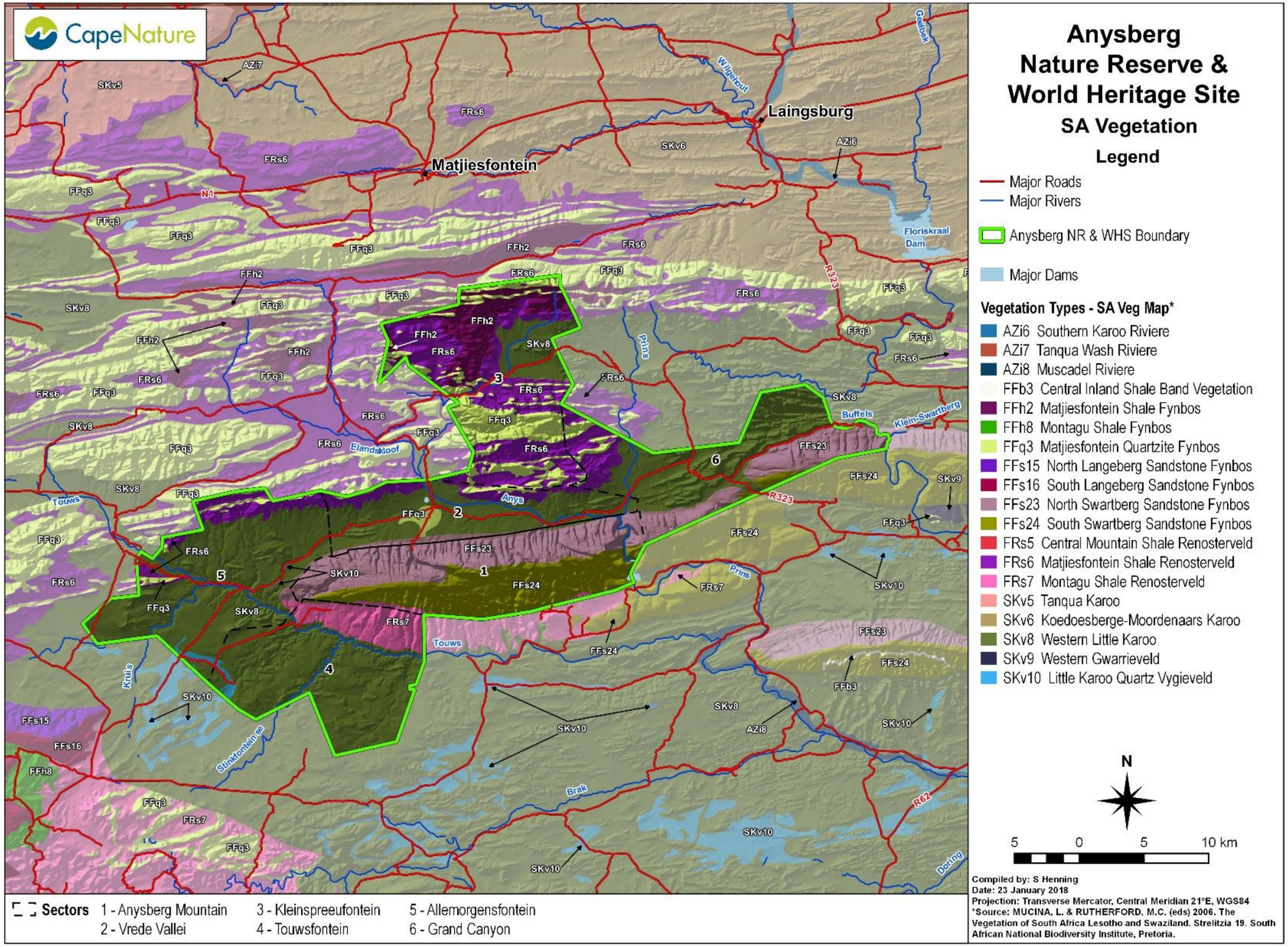
Map 3: Topography of Anysberg Nature Reserve and World Heritage Site.



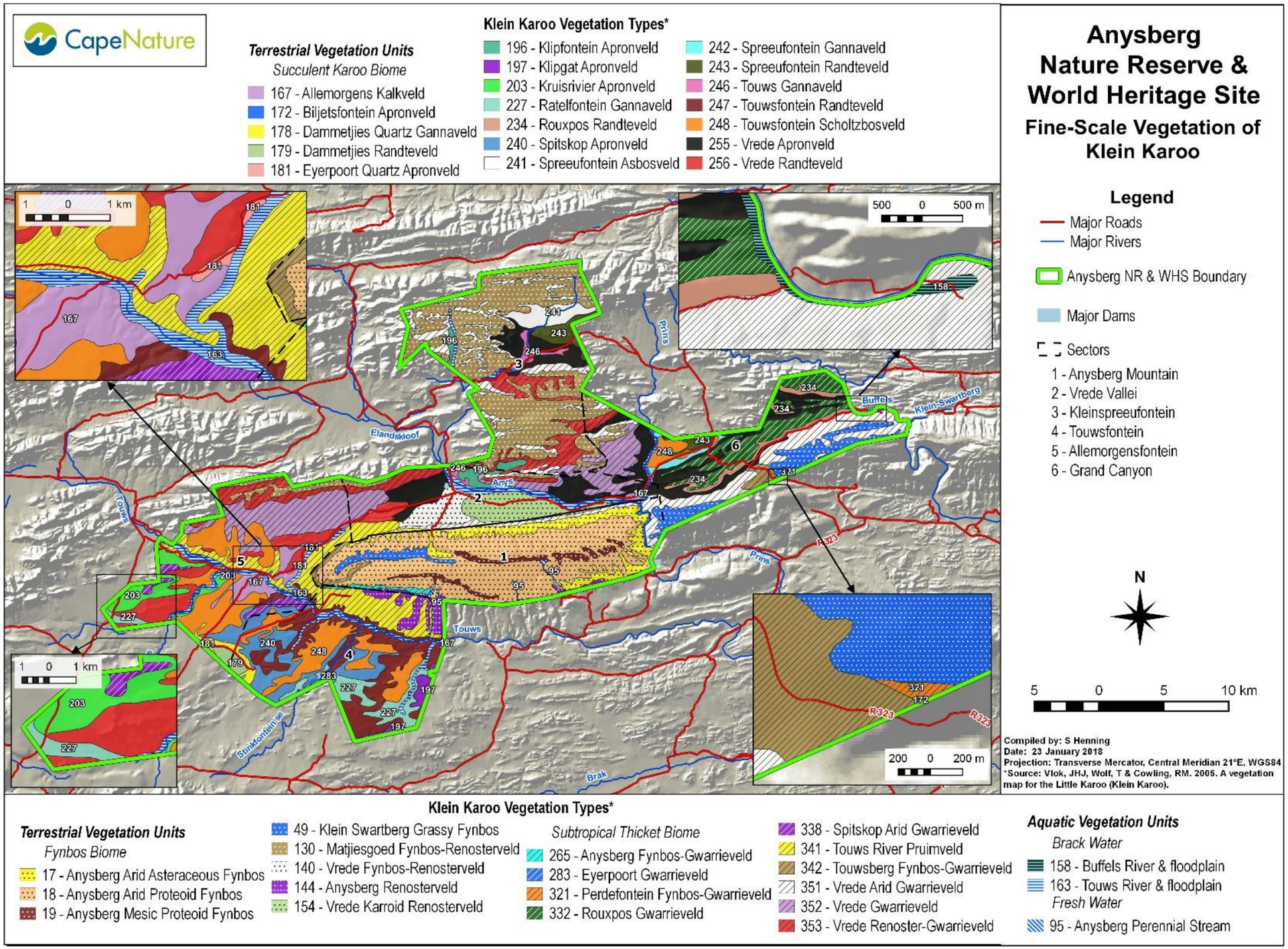
Map 4: Geology of Anysberg Nature Reserve and World Heritage Site (Council for Geoscience 2004).



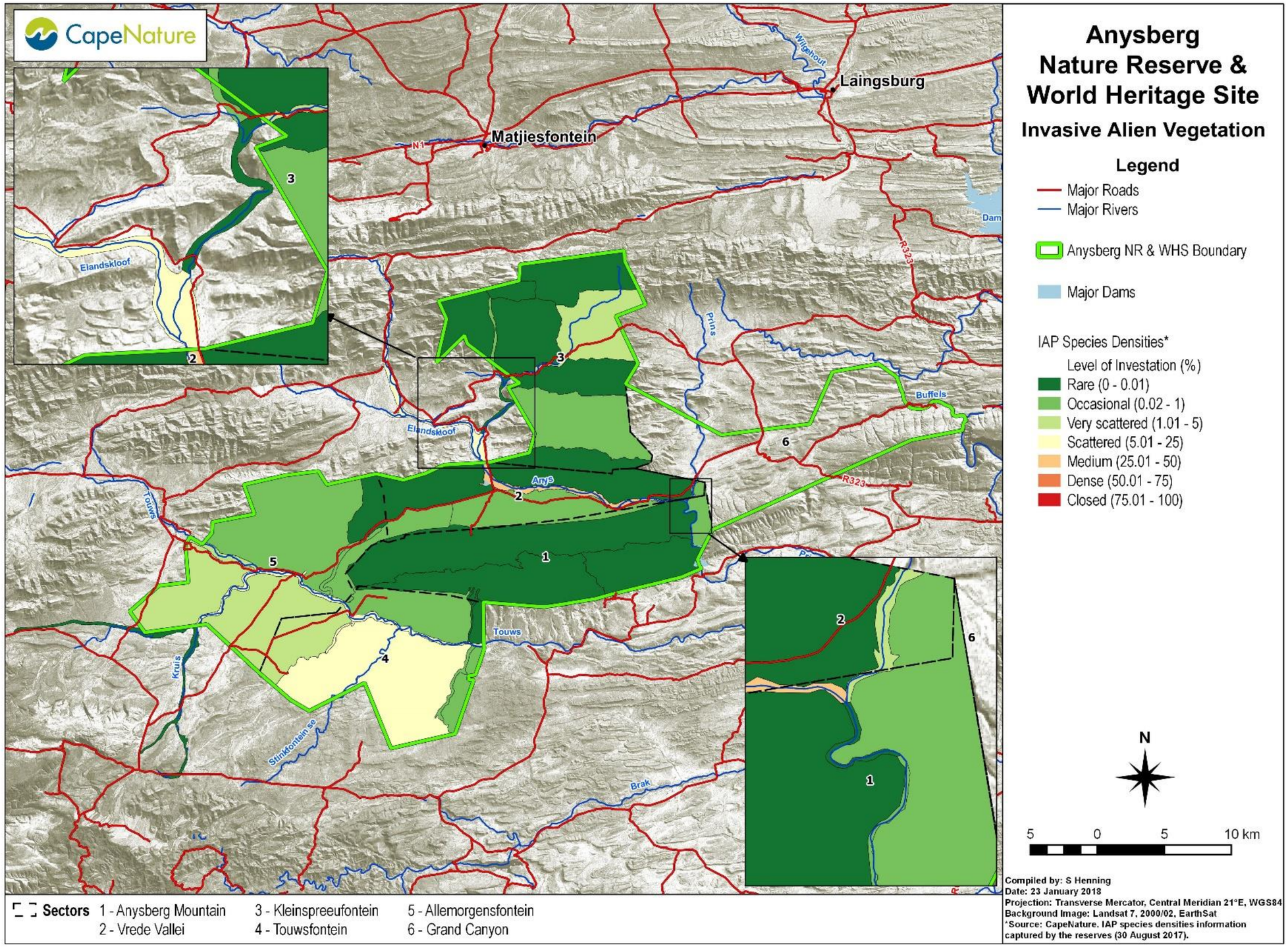
Map 5: Aquatic systems of Anysberg Nature Reserve and World Heritage Site.



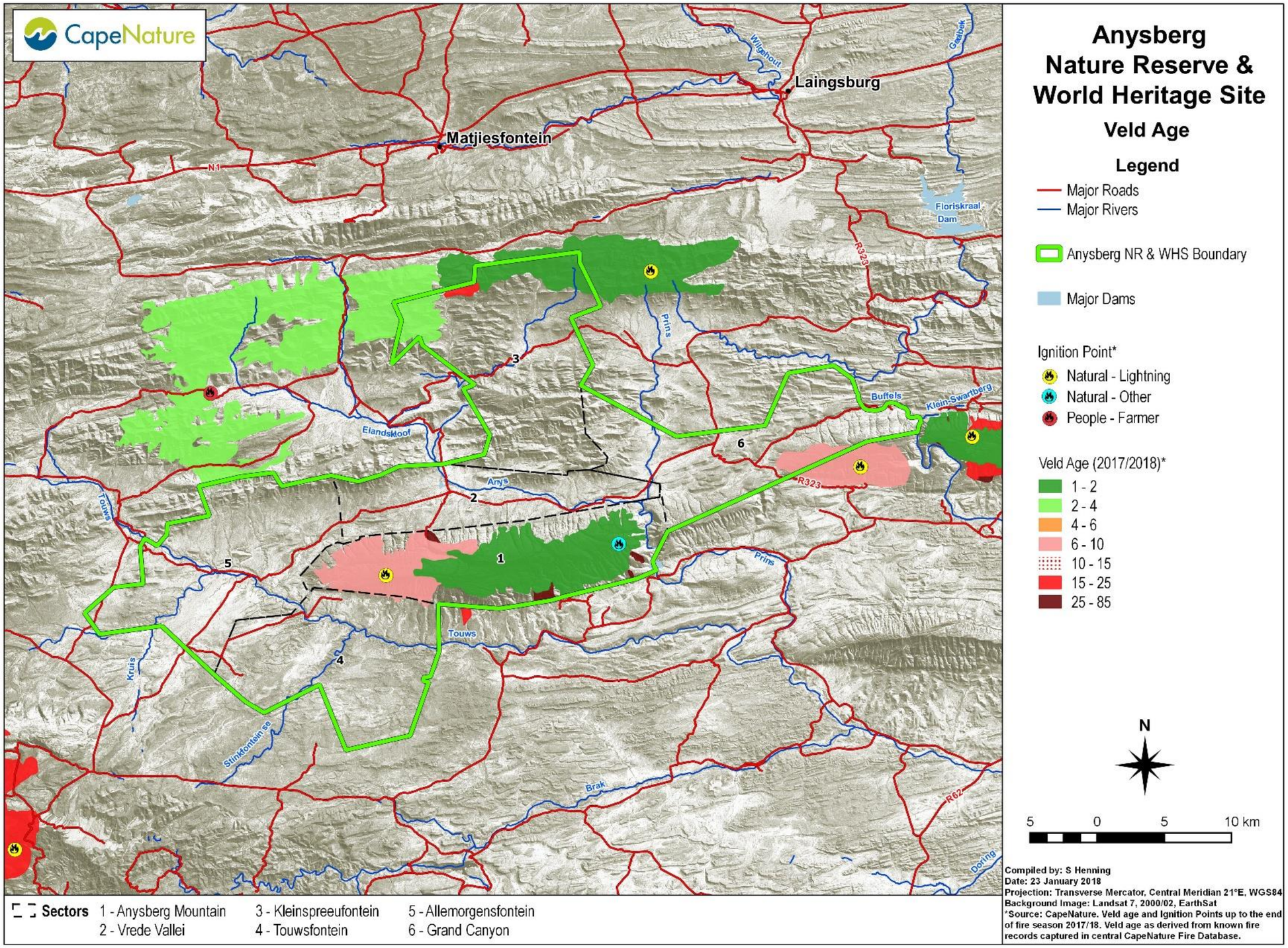
Map 6: Vegetation of Anysberg Nature Reserve and World Heritage Site based on the SA vegetation map (Mucina & Rutherford 2006).



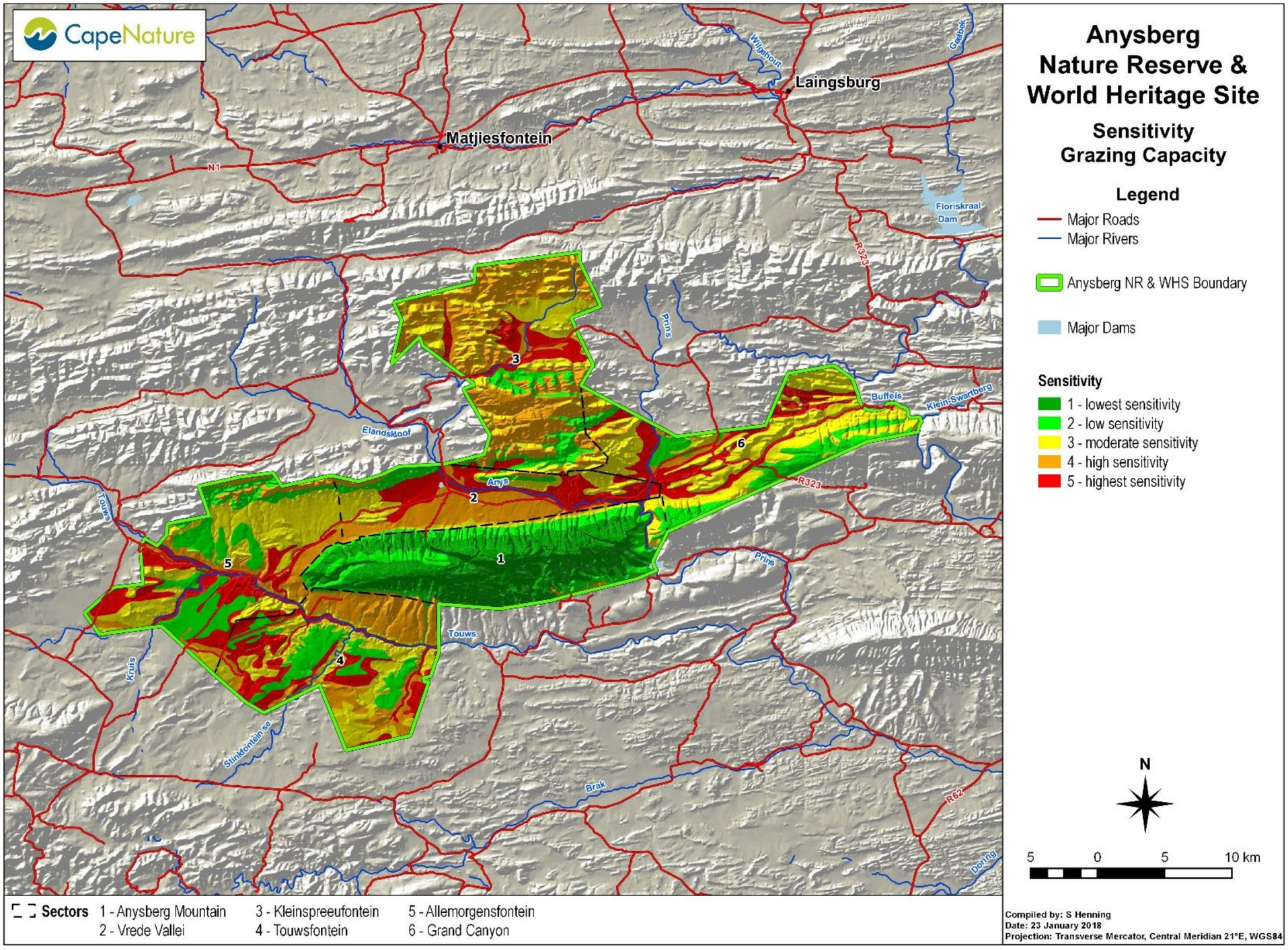
Map 7: Fine-scale vegetation map of Anyberg Nature Reserve and World Heritage Site based on the Klein Karoo vegetation map (Vlok *et al*. 2005).



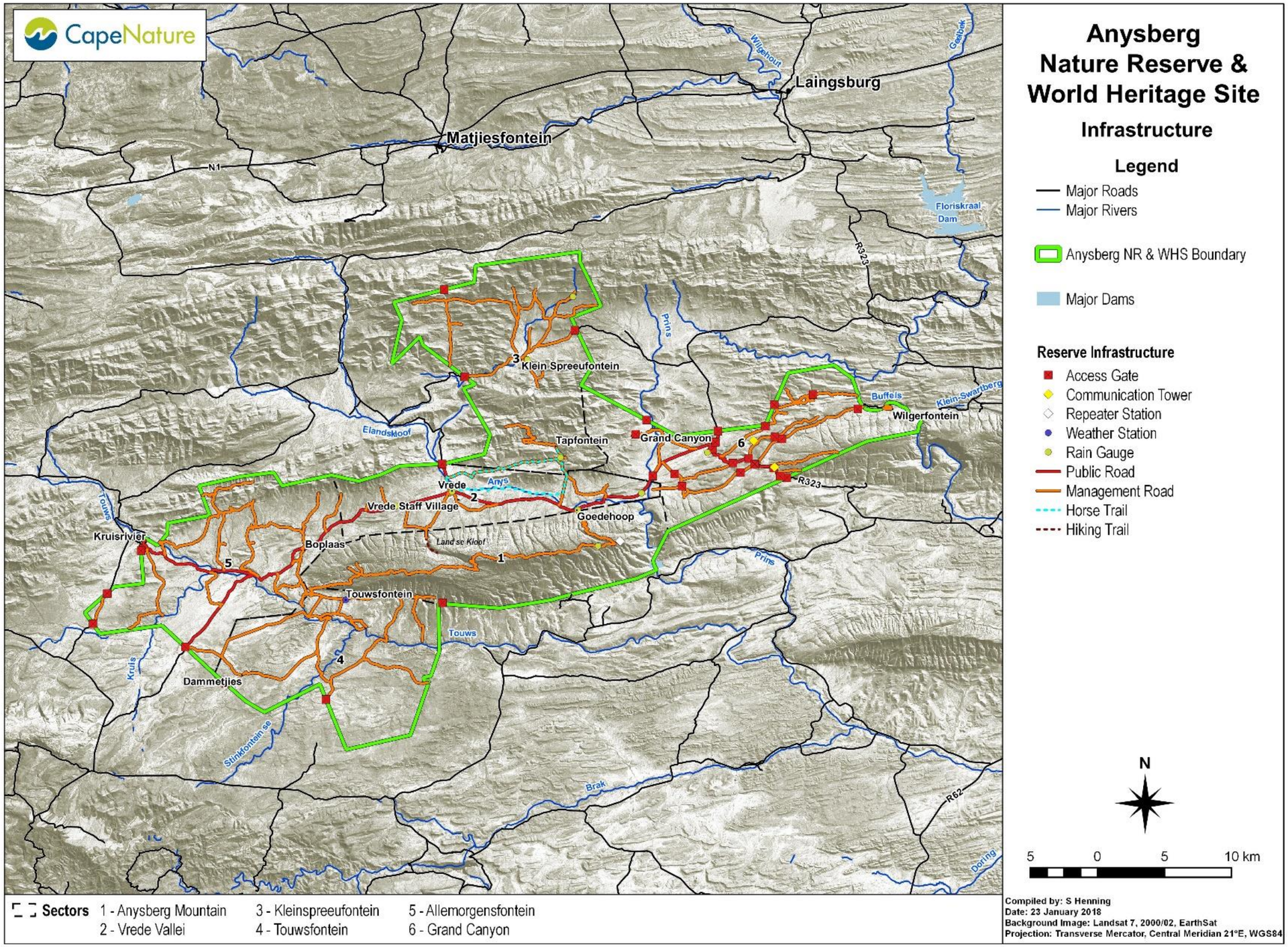
Map 8: Invasive alien vegetation map and management compartments of Anysberg Nature Reserve and World Heritage Site.



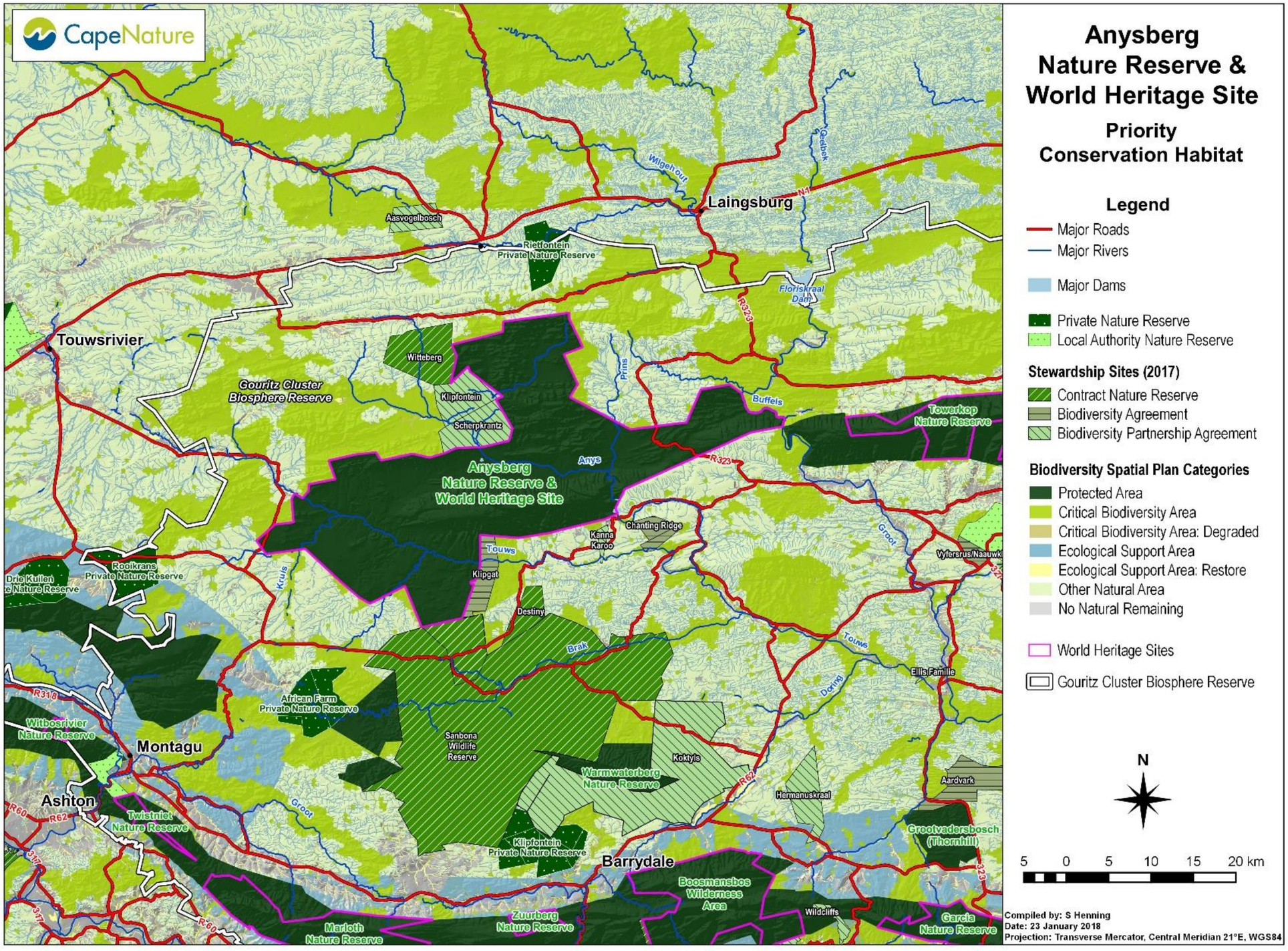
Map 9: Veld age map of Anysberg Nature Reserve and World Heritage Site.



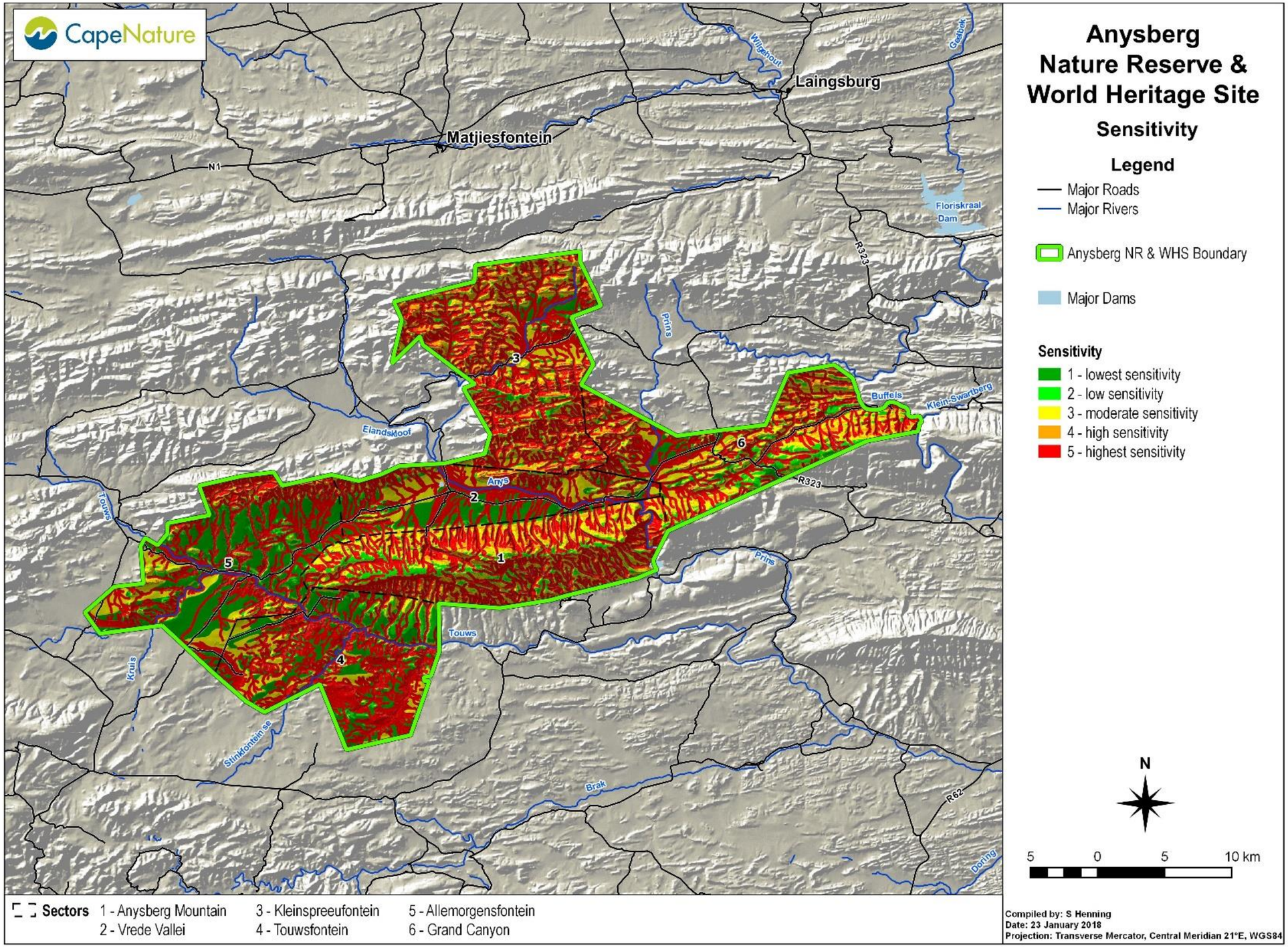
Map 10: Sensitivity of vegetation units on Anysberg Nature Reserve and World Heritage Site to grazing based on species targeted and availability.



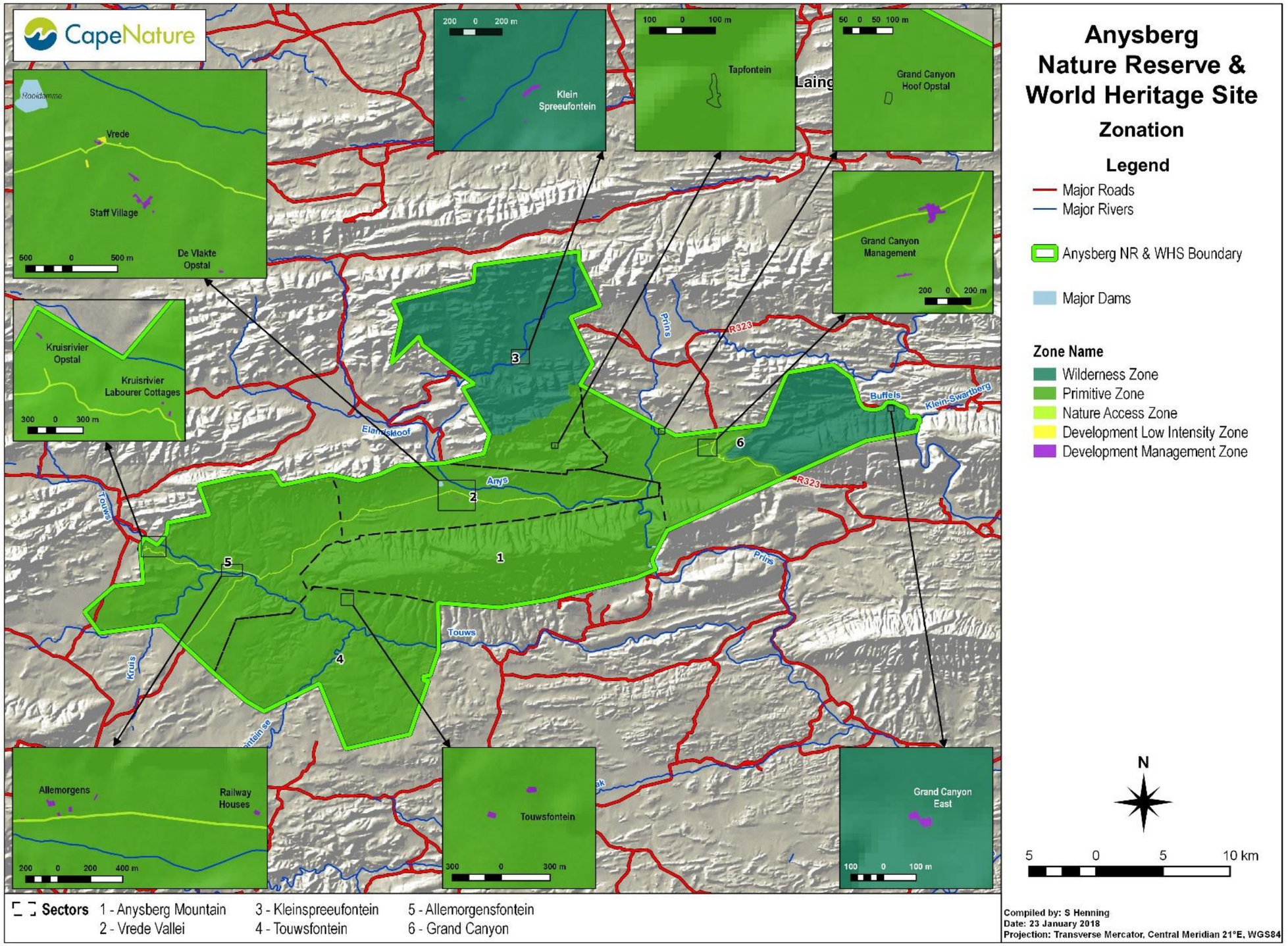
Map 11: Infrastructure map of Anysberg Nature Reserve and World Heritage Site.



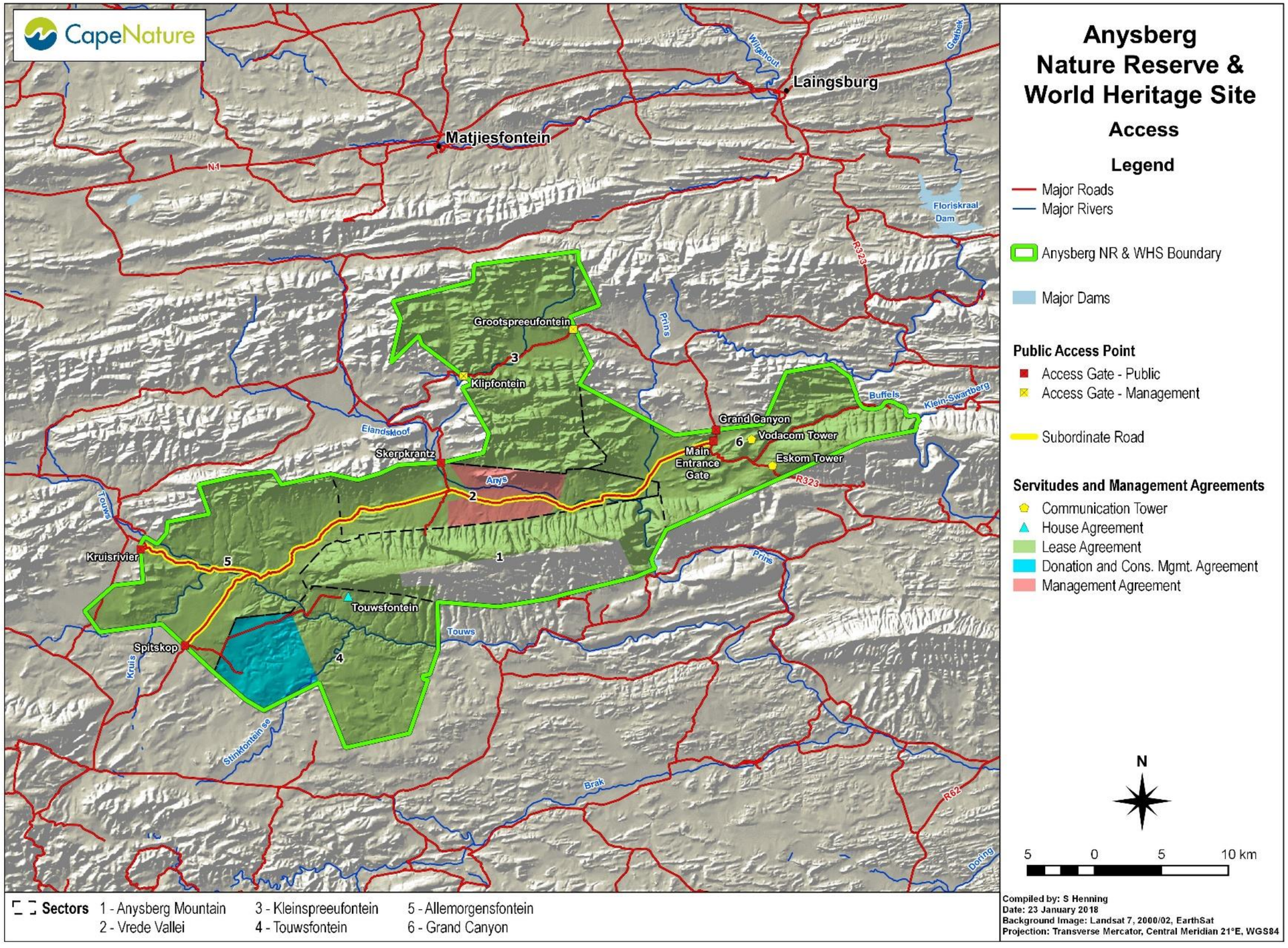
Map 12: Priority conservation habitat map of Anysberg Nature Reserve and World Heritage Site.



Map 13: Sensitivity map of Anysberg Nature Reserve and World Heritage Site based on physical, biodiversity and heritage features.



Map 14: Zonation map of Anysberg Nature Reserve and World Heritage Site.



Map 15: Access points, servitudes and management agreements on Anysberg Nature Reserve and World Heritage Site.

DEFINITION OF TERMS

Alien species	Species or genotypes, which are not indigenous to ANR&WHS and the surrounding area including hybrids and genetically altered organisms.
Biodiversity	The variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems (as per the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)).
Board	The Western Cape Nature Conservation Board as defined by the Western Cape Nature Conservation Management Act, 1997 (Act 9 of 1997).
Buffer zone	An area surrounding a protected area that has restrictions placed on its use or where collaborative projects and programmes are undertaken to afford additional protection to the nature reserve.
Cultural heritage	As defined in Article 1 of the World Heritage Convention (UNESCO) 1972 , 'cultural heritage' is considered as "monuments, architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of (…) value from the point of view of history, art or science, groups of buildings, groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of significance from the point of view of history, art or science, sites, works of man or the combined works of nature and man, and areas including archaeological sites which are of (…) value from the historical, aesthetic, ethnological or anthropological point of view." For the purpose of this management plan, living heritage features such as mountains, pools, rivers, boulders, *etc.* as well as palaeontological features are included under this definition.
Ecotourism	The travel to natural areas to learn about the way of life and cultural history of people, the natural history of the environment, while taking care not to change the environment and contributing to the economic welfare of the local people.
Ecological integrity	The sum of the biological, physical and chemical components of an ecosystem and its products, functions and attributes (as per the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)).
Ecosystem	A dynamic complex of animal, plant and micro-organism communities and their non-living environment interacting as a functional unit (as per the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)).
Ecosystem services	As defined in Section 1 of the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003) as "environmental goods and services" meaning: a. Benefits obtained from ecosystems such as food, fuel and fibre and genetic resources. b. Benefits from the regulation of ecosystem processes such as climate regulation, disease and flood control and detoxification. c. Cultural non-material benefits obtained from ecosystems such as benefits of a spiritual, recreational, aesthetic, inspirational, educational, community and symbolic nature;" Sustainable water production is also specifically included under this definition.

Environmental degradation	The deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems and the loss of species or undesirable reduction of species population numbers from a specific area from an environmental health perspective
CapeNature	Western Cape Nature Conservation Board as established in terms of the Western Cape Nature Conservation Management Act, 1997 (Act 9 of 1997).
Indigenous species	In relation to a specific protected area, means a species that occurs, or has historically occurred, naturally in a free state of nature within that specific protected area, but excludes a species introduced in that protected area as a result of human activity (as per the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)).
Invasive species	Means any species whose establishment and spread outside of its natural distribution range – a. Threaten ecosystems, habitats or other species or have a demonstrable potential to threaten ecosystems, habitats or other species. b. May result in economic and environmental harm or harm to human health. (As per the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)).
Management	In relation to a protected area, includes control, protection, conservation, maintenance and rehabilitation of the protected area with due regard to the use and extraction of biological resources, community-based practices and benefit sharing activities in the area in a manner consistent with the Biodiversity Act (as per the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003).
Management authority	In relation to a protected area, means the organ of state or other institution or person in which the authority to manage the protected area is vested (as per the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)).
Monitoring	The collection and analysis of repeated observations or measurements to evaluate change in status, distribution or integrity in order to track the impacts of directed management implemented to achieve a stated management objective.
Nature conservation	The conservation of naturally occurring ecological systems, the sustainable utilisation of indigenous plants and animals therein, and the promotion and maintenance of biological diversity (as per the Western Cape Nature Conservation Management Act, 1997 (Act 9 of 1997)).
Neighbouring community	The communities and people permanently living in the local municipal area/s bordering onto the Nature Reserve.
Natural heritage	As defined in Article 2 of the World Heritage Convention (UNESCO) 1972 'natural heritage' is as: "natural features consisting of physical and biological formations or groups of such formations, which are of (…) value from the aesthetic or scientific point of view, geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of (…) value from the point of view of science or conservation, natural sites or precisely delineated natural areas of (…) value from the point of view of science, conservation or natural beauty." For the purposes of this IMP, this would include the required ecological integrity of the protected area for the production of ecosystem services.
Partnerships	A co-operative and / or collaborative arrangement between partners (*e.g.* protected area, adjacent landowners, non-governmental organisations) that supports the achievement of the protected area's management objectives.

Protected areas	• Means any area declared or proclaimed as such in terms of section 3 or listed in the Second Schedule to the Western Cape Nature Conservation Management Act, 1997 (Act 9 of 1997); or • Means any of the protected areas referred to in section 9 of the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003).
Stakeholders/ interested parties	These are interested individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public. According to the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), "stakeholder" means a person, an organ of state or a community contemplated in section 82(1)(a), or an indigenous community contemplated in section 82(1)(b).
Sustainable	In relation to the use of a biological resource, means the use of such resource in a way and at a rate that would not lead to its long-term decline; would not disrupt the ecological integrity of the ecosystem in which it occurs; and would ensure its continued use to meet the needs and aspirations of present and future generations of people (as per National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).
Wilderness area	Means an area designated in terms of section 22 or 26 for the purpose of retaining an intrinsically wild appearance and character, or capable of being restored to such and which is undeveloped and roadless, without permanent improvements or human habitation (as defined by the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003).
World Heritage Site	Means a World Heritage Site as defined in the World Heritage Convention Act, 1999 (Act 49 of 1999) under Chapter 1, section 1 subsection (xxiv).