LANGEBERG COMPLEX

PART OF THE
CAPE FLORAL REGION PROTECTED AREAS WORLD HERITAGE SITE
Western Cape, South Africa

Protected Area Management Plan 2020 – 2030

DATE APPROVED: [Date]

MOST RECENT UPDATE: 27 January 2020

CapeNature

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Western Cape Government

United Nations Educational, Scientific and Cultural Organization

World Heritage Convention

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CITATION
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AUTHORISATIONS

In terms of section 41(4) the Minister hereby approves part of the Protected Area Management Plan for the Langeberg Complex designated as World Heritage Site and Marine Protected Areas (See Appendix 1 Table 1).

TITLE	NAME	SIGNATURE	DATE
NATIONAL MINISTER: Environment, Forestry and Fisheries	Ms Barbara Creecy		

In terms of section 41(4) the Member of Executive Council (MEC) hereby approves part of the Protected Area Management Plan for the Langeberg Complex designated as Provincial Nature Reserves, state forest managed by CapeNature as nature reserve and Forest Wilderness Areas (everything not included above – see Appendix 1 Table 2).

TITLE	NAME	SIGNATURE	DATE
PROVINCIAL MINISTER: Department of Environmental Affairs and Development Planning	Mr Anton Bredell		

Recommended:

TITLE	NAME	SIGNATURE	DATE
CHAIRPERSON OF THE BOARD: Western Cape Nature Conservation Board	Assoc Prof Denver Hendricks		5/3/2020
CHIEF EXECUTIVE OFFICER: CapeNature	Dr Razeena Omar		05/03/2020

Review Date: 10 years from the date of approval by the MEC and Minister.

ACKNOWLEDGEMENTS

Stakeholders are thanked for their participation and contribution to the development of this management plan.

This management plan was prepared by the reserve management committee comprised of Antoinette Veldtman, Vicki Hudson, Zimasa Gibisela, Daleen Burger, Jean du Plessis, Ian Allen, Henry van Tonder and Tierck Hoekstra with significant inputs from the following persons and components:

- AnneLise Schutte-Vlok, Natalie Baker and Ruida Stanvliet for initiating the process, and facilitation of ecological target setting, threat assessment and vision statement.
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- Alexis Olds (marine and coastal systems, marine and estuarine fish)
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- Kevin Shaw (avifauna)
- Natalie Baker (mammals)
- Therese Forsyth (sensitivity, zonation and zone of influence)
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- Jan Vlok (viability of the Fynbos, Succulent Karoo and Subtropical Thicket conservation targets)
- Mandy Lombard (marine and coastal conservation targets)
- All contributors of photos

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Chris Martens (Fynbos Trust - Director) is thanked for the external review.

Cover page images courtesy of Ian Allen (primary image) and Jean du Plessis (secondary image).

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GLOSSARY

Derived from: Conservation Measures Partnership (CMP) 2013; SANParks.

Term	Explanation
Adaptive Management	The incorporation of a formal learning process into conservation action. Specifically, it is the integration of knowledge, management, and monitoring, to provide a framework to systematically test assumptions, promote learning, and supply timely information for management to make decisions and adjust actions based on outcomes of monitoring.
Factor	A generic term for an element of a conceptual model including direct and indirect threats, opportunities, and associated stakeholders. It is often advantageous to use this generic term since many factors – for example tourism – could be both a threat and an opportunity. Also known as root causes or drivers.
Focal Value	An element of biodiversity (natural value) or heritage (cultural value) of the Complex, which can be a species, habitat, ecological system, or heritage feature, that management strives to protect, and threats towards which management should strive to minimise. All focal conservation values at a site should collectively represent the biodiversity and heritage features of concern at the site.
Goal	A formal statement detailing a desired impact of a project, such as the desired future status of a target. A good goal meets the criteria of being linked to targets, impact oriented, measurable, time limited, and specific.
Indicator	A measurable entity related to a specific information need such as the status of a value / factor, change in a threat, or progress toward an objective. A good indicator meets the criteria of being: measurable, precise, consistent, and sensitive.
Key (Ecological) Attribute	An aspect of a focal value's biology or ecology that if present, define a healthy focal value and if missing or altered, would lead to the outright loss or extreme degradation of that focal value over time.
Objective	A formal statement detailing a desired outcome of a project such as reducing a critical threat. A good objective meets the criteria of being: results oriented, measurable, time limited, specific, and practical. If the project is well conceptualized and designed, realization of a project's objectives should lead to the fulfilment of the project's goals and ultimately its vision. Compare to vision and goal.
Results Chain	A graphical depiction of management's core assumptions, the logical sequence linking project strategies to one or more targets. In scientific terms, it lays out hypothesized causal relationships. A results chain is a depiction of a 'theory of change', i.e. the state of the system after action.
Vision	A description of the desired long-term future or ultimate condition that stakeholders see and management strives to achieve for the Complex.
Heritage Resources	Means any place or object of cultural significance as per the HRA
Living Heritage	Means the intangible aspects of inherited culture, and may include— (a) cultural tradition; (b) oral history; (c) performance; (d) ritual; (e) popular memory; (f) skills and techniques; (g) indigenous knowledge systems; and

	(h) the holistic approach to nature, society and social relationships; in terms of the Heritage Resources Act, 1999 (Act No. 25 of 1999).
Situation Analysis	The purpose of a situation analysis is to understand the relationships between the biological environment and the social, economic, political, and institutional systems and drivers that affect the focal values of the Complex.

ACRONYMS AND ABBREVIATIONS

ASPT	Average Score Per Taxon
BRUV	Baited Remote Underwater Video
CBA	Critical Biodiversity Area
CCNET	Conservation Coaches Network
CFE	Cape Fold Ecoregion
CFR	Cape Floristic Region
CFRPA	Cape Floristic Region Protected Areas
CMP	Conservation Measures Partnership
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries (Old National)
DEA	Department of Environmental Affairs (Old National)
DEAT	Department of Environmental Affairs and Tourism (Old National)
DEFF	Department of Environment, Forestry and Fisheries (New National)
DTPW	Department of Transport and Public Works (Provincial)
DWAF	Department of Water Affairs and Forestry (Old National)
DWS	Department of Water and Sanitation (Old National)
EPWP	Expanded Public Works Programme
FPA	Fire Protection Association
GIS	Geographical Information System
GCBR	Gouritz Cluster Biosphere Reserve
IDP	Integrated Development Plan
IUCN	International Union for Conservation of Nature
MEC	Member of Executive Council
METT-SA	Management Effectiveness Tracking Tool - South Africa
MCA	Mountain Catchment Area
MPA	Marine Protected Area
MTEF	Medium Term Expenditure Framework
NEM: PAA	National Environmental Management: Protected Areas Act
NFEPA	National Freshwater Ecosystem Priority Area
NGO	Non-governmental Organisation
NPAES	National Protected Area Expansion Strategy
PAAC	Protected Area Advisory Committee
PAES	Protected Areas Expansion Strategy

SANBI	South Africa National Biodiversity Institute
SDF	Spatial Development Framework
SG	Surveyor-General
SMME	Small, medium and micro-sized enterprise
U-AMP	User Asset Management Plan
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WCBSP	Western Cape Biodiversity Spatial Plan
WCPAES	Western Cape Protected Area Expansion Strategy
WWF-SA	World Wide Fund for Nature – South Africa

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EXECUTIVE SUMMARY

In compliance with the National Environmental Management: Protected Areas (NEM: PA) Act, 2003 (Act No. 57 of 2003) and Chapter 4 of the World Heritage Convention Act, 1999 (Act No. 49 of 1999), the management authority of a protected area is required to develop management plans for each of its protected areas.

Boosmansbos Wilderness Area, part of the Langeberg Complex was inscribed as a World Heritage Site by the World Heritage Convention, United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 2004 and extended in 2015 to include the entire Langeberg Complex as part of the Cape Floristic Region Protected Areas World Heritage Site. The latter comprises a serial property of nine protected areas covering a total area of approximately 41 566 ha*. The Langeberg Complex is supported and buffered by a wide network of adjacent or surrounding conserved areas ranging from Provincial Nature Reserves to Private Nature Reserves, Stewardship sites and Mountain Catchment Areas.

The Langeberg Complex forms part of the Gouritz Cluster Biosphere Reserve. This biosphere reserve is the largest in South Africa at 3 187 893 ha and creates a corridor along the Gouritz River, where naturally occurring indigenous animals and plants could disperse freely from the conservation areas of the inland mountains (Anysberg-Swartberg and Gamkaberg-Rooiberg ranges) to those of the coastal Langeberg-Outeniqua mountains ranges.

The Langeberg Complex Management Plan comprises 12 sections. The introduction in Section 1 provides an outline of the purpose of the Protected Area Management Plan (PAMP). The national minister is authorised under section 25(1) of the World Heritage Convention Act, 1999 (Act No. 49 of 1999) to approve the management plan for a protected area so nominated, or declared under the World Heritage Convention Act, 1999 (Act No. 49 of 1999).

Both the national minister and MEC in a particular province has concurrent jurisdiction to approve a management plan for a protected area submitted under section 39(2) of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003).

In developing the management plan for the Langeberg Complex, CapeNature as the management authority strives to establish biodiversity conservation as a foundation for a sustainable economy, providing ecosystem services, access and opportunities for all.

Section two outlines the legal status of the Langeberg Complex and provides the biophysical and ecological context. The Complex is situated in the Western Cape, South Africa and is approximately 52 413 ha*. The inland, mountainous section runs along a 155km east-west gradient between Goedemoed Area (Koo Valley) near Montagu in the North West, in a south easterly direction to Ashton, Swellendam, Suurbraak and north east towards Barrydale and the Gouritz River. An inland to coast linkage is formed along the Goukou River to the Geelkrans Nature Reserve Cluster in the south at Stilbaai and Jongensfontein.

* As calculated from the CN_reserve_cadastre_2018.shp layer.

The Langeberg Complex represents outstanding examples of significant ongoing ecological and biological processes in the evolution of terrestrial ecosystems and plant communities such as a natural fire regime, and natural flow of water through the area supporting unique indigenous freshwater fish assemblages and agricultural sectors, and connectivity for species migration, gene flow, dispersal, etc. In addition, the Complex contains important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value. The Complex is a centre of endemism for plants, amphibians, small mammals and importantly, endemic and threatened freshwater fish.

Moreover, the Langeberg Complex Mountain Catchment Area spans five discrete catchments and is identified as one of South Africa's national Strategic Water Source Areas. This catchment provides good quality water for local urban areas, including the towns of Swellendam, Barrydale and Heidelberg.

The remainder of section two gives the socio-economic and organisational context of the Langeberg Complex.

Section three describes the policy framework under which the Langeberg Complex operates. CapeNature is subject to the framework of the Constitution of the Republic of South Africa (1996), national legislation including the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003), National World Heritage Convention Act, 1999 (Act No. 49 of 1999) and all associated regulations and norms and standards for the Management of Protected Areas in South Africa and all other relevant requirements as set out in the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and the National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008).

This section provides the purpose of protected area management and the guiding principles under which it operates. This section further highlights CapeNature's application of a Strategic Adaptive Management Cycle. The organisation followed the Open Standards for the Practice of Conservation, which is an adaptive management framework that enables management teams to develop the most effective conservation strategies based on the best available traditional, expert and scientific information. The Open Standards framework facilitates Strategic Adaptive Management through the identification of explicit measures of success and the incorporation of lessons learned over time. It furthermore sets out the principles and procedures followed for Protected Area Management Effectiveness, Monitoring and Evaluation and explains the policy frameworks under which the Langeberg Complex operates.

Section four outlines procedures for stakeholder engagement during the development of the management plan, including formal processes for public comment on the draft plan, and establishes procedures for public participation during the implementation phase of this plan.

Section five states the purpose and the vision of the Langeberg Complex. This section makes provision for CapeNature to manage the Complex exclusively for the purpose for which it was declared. It presents the vision, purpose, focal values and key threats foundational to developing the desired state for the Complex. The vision of the Langeberg Complex is:

"The Langeberg Complex conserves living land- and seascapes through partnerships for the benefit of all generations".

The Langeberg Complex focal values are: the Fynbos Mosaic (includes Afromontane Forest and coastal vegetation), Succulent Karoo, Freshwater Ecosystems, Estuarine Environment, Marine Environment and the Cultural Heritage and Rural Landscape of the Complex. A host of human wellbeing benefits will flow from the Complex's natural and cultural assets including, and of particular importance to the Complex, Freedom of choice and capacity to act independently, tourism and nature based economic opportunities, Security from natural disasters and Water Security and environmental resilience. The main threats to the focal biodiversity values of the Langeberg Complex were identified as:

- Unsustainable and illegal harvesting of resources in the marine and estuary environment;
- Instream and riparian modification;
- Over abstraction of surface and groundwater;
- Water pollution;
- Agricultural expansion;
- Urban expansion, commercial and industrial developments;
- Invasive alien plants;
- Inappropriate fire regime; and
- Uncontrolled recreational activities.

Clear measurable outcome-based goals, strategies and objectives were based upon the information derived from the viability and threats assessment of the focal conservation targets. A desired future condition was established for conservation values by setting measurable, time-bound goals directly linked to the values and their key attributes. Goals are underpinned by strategies affected by management actions and essential activities.

The goals for the Langeberg Complex are as follows:

1. By 2030 Fynbos mosaic in the Langeberg Complex has an ecologically healthy fire regime* and comprises 95% indigenous species and reseeding Protea species are represented as per historic data**.
   *Three veld age classes fall between 5-20% of the Protected Area, 75 - 90% of the area burnt during December-April, fire return intervals Southern slopes: >15 years since last fire; Northern slopes: >20 years, 0% of Afromontane forest has burnt; **According to the Protea Atlas data.

2. By 2030, the Succulent Karoo vegetation mosaic within the Langeberg Complex will consist of 99% indigenous vegetation and ecotypical species populations will remain stable.

3. By 2030 the wetland buffer and riparian zones** of the Langeberg Complex will have 80% natural vegetation.
   ** Definition in National Water Act, 1998 (Act No. 36 of 1998) of riparian zone

4. By 2030 the upper and middle river reaches in the Langeberg Complex supporting macro invertebrate species communities represent an average score per taxon (ASPT) of 6-8 with >50% of expected fish species present in at least two age classes and have a natural flow regime*.
   *100% flow for all portions except Kruis River, which should be more than 80%.

5. By 2030 the health of the Langeberg Complex wetland ecosystems will be in a natural (A)* to near-natural (B)** condition.
   *Unmodified; ** A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.

6. By 2030 the estuarine health index category of the Goukou Estuary will be Category B*.
   *As defined in the Goukou Situation Assessment Report prepared by the CSIR (2011).

7. By 2030 there will be an increase in abundance and presence of depleted, endangered and endemic reef species in the near shore zone of the Stilbaai Marine Protected Area.

8. By 2030 the health* of the intertidal zone of the Stilbaai Marine Protected Area will be maintained from the current baseline state.
   *Stable populations of indicator species of the south coast/Agulhas mixed zone.

9. By 2030 unnatural disturbances to heritage features are limited to maintain current conditions within the Langeberg Complex.

10. By 2030 natural resources within the Langeberg Complex are managed equitably for legitimate access, are in accordance with CapeNature policy and procedures and is taking place in such a way that they will be available for current and future generations.

Achieving human well-being, derived from healthy responsibly-managed ecological infrastructure and heritage, requires that:

11. By 2030 access to environmentally responsible infrastructure*, intact ecosystems and optimal biodiversity adding economic value to ecotourism products and socio economic development is sustainably facilitated and maintained.
    *Aligned with the zonation scheme.

12. By 2030 the Langeberg Complex provides managed opportunities for accessing nature and nature-based activities in a manner which is not harmful to the natural environment.

13. By 2030 the coordinated disaster management plan will promote and facilitate security from natural disasters, for example (but not limited to) wild fire, drought and flooding for the benefit of the target communities.

14. By 2030 the Langeberg Complex will, through integrated catchment management, protect and enhance the provision of water quality and quantity contributing to the water resilience for the Breede-Gouritz catchment management area.

The remainder of section five presents the results of the sensitivity analysis of the Langeberg Complex. The sensitivity analysis was based on biodiversity, heritage and physical informants and allows for the evaluation of the sensitivity of the different sections of the nature reserve complex with regards to human activity and development of sites both within and between reserves to support CapeNature's planning at local and regional scales. 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.

Section six outlines the zoning plan for the Langeberg Complex. The Complex forms part of a planning matrix and locating the Complex in terms of the municipal integrated development plan (IDP) is aimed at minimising conflicting development in either the protected area or the neighbouring municipal area. It furthermore establishes a coherent spatial framework within and around the Complex to guide and co-ordinate conservation, tourism and visitor experience, access and utilisation, and stakeholder and neighbour relations. It intends to minimise user conflict by separating potentially conflicting activities such as wildlife viewing, recreational activities and tourism accommodation, whilst ensuring that activities and utilisation continues in appropriate areas and do not conflict with the goals and objectives of the Complex.

Section seven describes infrastructure and procedures necessary for management of the Langeberg Complex, inclusive of operations and visitors. It provides information on access facilities, operational facilities, control measures as well as commercial and community use.

Section eight deals with expansion of the Langeberg Complex and is aligned with CapeNature's 2015-2020 Protected Areas Expansion Strategy (PAES). Sites have been identified through systematic conservation planning and include sites that contain Critical Biodiversity Areas (CBAs). The main mechanism for expansion for this Complex is through Stewardship and the acquisition of Forestry Exit Areas for sites identified as priority areas in the PAES.

Section nine presents the concept development plan, which sets out the long-term plan for the development of the Langeberg Complex in keeping with the purpose of the Complex and with due consideration for protected area expansion and the zoning plan.

Section ten presents the Strategic Plan for the Langeberg Complex. The strategic plan was derived from an assessment of the conservation situation, inclusive of the biological environment and the social, economic, cultural and institutional systems that influence values. Strategic intervention points formed the basis for developing strategies from which detailed actions with timeframes were developed to guide implementation, monitoring and evaluation. The strategies of the Langeberg Complex that were identified to abate critical threats to focal conservation targets are (in no particular order or prioritisation):

Strategy 1: Enhance the implementation efficiency of invasive alien plant management by the integration of fire and invasive alien plant management through the development of an invasive alien species control plan for the Langeberg Complex.

Strategy 2: Enhance integrated fire and invasive alien plant management through the implementation of the CapeNature Integrated Catchment Management Strategy and Fire Policy, and future revisions.

Strategy 3: Through partnership, address invasive alien plant clearing and compliance within the zone of influence of the Langeberg Complex.

Strategy 4: Practice integrated fire management as per the CapeNature fire policy (and by being National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) compliant) in conjunction with partners and stakeholders through the development of an integrated fire management plan for the Langeberg Complex.

Strategy 5: Promote co-operative governance by implementing the Langeberg Complex integrated compliance plans through the enhancement of intergovernmental and relative Non-Governmental Organisations (NGO) relationships that mitigate negative impacts on biodiversity through the compliance with legislation.

Strategy 6: Develop and implement a comprehensive, progressive management plan to facilitate sustainable, responsible access and tourism in the Langeberg Complex.

Strategy 7: Address the natural resource use in the marine and estuarine environment through implementation of the Geelkrans Nature Reserve Cluster Integrated Compliance Plan.

Strategy 8: Through partnerships with relevant stakeholders, address:

- Water use best practice and compliance;
- Natural resource use in the marine and estuarine environment;
- Prevention / monitoring / lack of knowledge regarding water pollution (to improve water quality);
- Instream and riparian modification.

Strategy 9: Develop and implement an integrated environmental education and awareness programme aimed at neighbours, resource users, school groups and visitors to nurture respect and care for the natural, cultural and historic values of the Langeberg Complex.

Strategy 10: Contribute to economic and social development by providing jobs and training opportunities to Expanded Public Works Programme (EPWP), contract and small, medium and micro-sized enterprise (SMME) staff.

Section eleven provides an overview of costing and fund allocation for strategies. It outlines the existing financial resources (current budget), funding shortfalls, sources of alternate funding and future financial projections.

Finally, section twelve contains the references, Appendix 1 has a list of the land parcels constituting the Langeberg Complex, Appendix 2 contains the maps discussed in the management plan and Appendix 3 contains the stakeholder engagement report.

1 INTRODUCTION

In working towards CapeNature's vision of conserving nature for a sustainable future, CapeNature's protected area management, in accordance with the purpose of the protected area, strives to:

- Conserve and represent natural habitats and indigenous biodiversity including threatened species for their scientific and conservation value in the Western Cape Province;
- Conserve representative samples of significant ongoing ecological processes in the evolution and development of ecosystems and communities of plants and animals;
- Provide ecosystem services that benefit people of the Western Cape;
- Manage protected areas effectively and efficiently, including the interrelationships between biophysical, social and economic environments;
- Ensure that protected area planning and management is integrated and participatory; and
- Provide for sustainable use and equitable access.

The management plan is a strategic adaptive management framework for the protected area, guided by the Open Standards for the Practice of Conservation (hereafter referred to as the Open Standards) (CMP 2013) adaptive management paradigm. The Open Standards is dependent upon, and promotes stakeholder engagement and participatory planning in the development of the plan. The framework further stimulates the incorporation of mechanisms to facilitate stakeholder engagement and participation during operationalisation of the plan.

The Langeberg Complex protected area management plan serves as a reference to the management and development of the Complex in its current and envisaged future state. It directs management at all levels. The management plan addresses:

- The mandate, human capacity and financial resources that are required to meet goals and objectives based on the condition of natural and cultural values, and core service areas requiring a focused effort;
- The delivery of socio-economic benefits to neighbouring communities;
- Flexibility of service delivery that encourages innovation and involvement by a wide range of government, community and non-government sectors;
- Performance indicators and accountability measures that provides for regular review and adaptive management.

2 LEGAL STATUS AND BACKGROUND

This section provides a record of the legal status of the protected area, as well as its description, location and includes any areas designated by South Africa in terms of international agreements. Furthermore, it also provides an overview of the biophysical, biodiversity, heritage and socio-economic context.

2.1 Legal Status

2.1.1 Name and legal designations

The Langeberg Complex comprises the following, using the terminology as indicated in the declarations according the Nature Conservation Ordinance, National Forest Act, 1998 (Act No. 84 of 1998) and National Environmental Management: Protected Areas Act (NEM: PAA), 2003 (Act No. 57 of 2003) and as reflected on the Protected Areas Register held by the Department of Environment, Forestry and Fisheries (DEFF):

- Marloth Nature Reserve Cluster
    - Marloth Forest Nature Reserve
    - Twistniet (previously part of Swellendam State Forest in a process of transfer to CapeNature)
    - Witbosrivier (previously part of Swellendam State Forest in a process of transfer to CapeNature)
    - Zuurberg (previously part of Swellendam State Forest in a process of transfer to CapeNature)
- Grootvadersbosch Nature Reserve Cluster
    - Grootvadersbosch Forest Reserve
    - Boosmansbos Wilderness Area
    - Garcia (previously part of Garcia State Forest in a process of transfer to CapeNature)
    - Kruis River Wetland Nature Reserve (Broomvlei)
    - Paardeberg (previously part of Garcia State Forest in a process of transfer to CapeNature)
    - Spioenkop (previously part of Garcia State Forest in a process of transfer to CapeNature)
    - Tygerberg (previously part of Garcia State Forest in a process of transfer to CapeNature)
    - Warmwaterberg (previously part of Grootvadersbosch State Forest in a process of transfer to CapeNature)
    - Thornhill (Doornkloof)
- Geelkrans Nature Reserve Cluster
    - Geelkrans Nature Reserve (both State Forest Nature Reserve and Provincial Nature Reserve)
    - Blomboschfontein Nature Reserve (previously part of Garcia State Forest in a process of transfer to CapeNature)
    - Kleinjongensfontein Nature Reserve (previously part of Garcia State Forest in a process of transfer to CapeNature)
    - Remainder of Erf 216, Still Bay East
    - Stilbaai Marine Protected Area (MPA)

The above-mentioned land parcels, excluding the Wilderness Areas and MPA, are refered to as Nature Reserves throughout the document, including the maps, as per standard practice for CapeNature managed land.

The following components form part of the Cape Floristic Region Protected Areas (CFRPA) World Heritage Site:

Already declared in terms of Notice 72 of 2009 as published in Government Gazette 31832 of 30 January 2009:

- Boosmansbos Wilderness Area

Inscribed by United Nations Educational, Scientific and Cultural Organisation (UNESCO) as part of the 2015 extension to the CFRPA World Heritage Site, but not yet declared:

- Marloth Nature Reserve
- Grootvadersbosch estate including the State Forest
- Witbosrivier (Part of the ex Swellendam State Forest).
- Twistniet (Part of the ex Swellendam State Forest).
- Zuurberg. (Part of the ex Swellendam State Forest).
- Garcia Forest (Part of the ex Garcia State Forest)
- Spioenkop (Part of the ex Garcia State Forest)
- Paardeberg (Part of the ex Garcia State Forest)
- Tygerberg (Part of the ex Garcia State Forest)

The above list refers to nature reserves in the title however the land parcel is not necessarily declared as such. A full list of the declarations and legal status of land appears in Appendix 1 in Table 1 and 2.

2.1.2 Contractual agreements

Protected areas managed by way of contractual agreements are one of the options available for protected area expansion for the Langeberg Complex to manage land for conservation and improve the ecological representation of on both private and state land. The following land was incorporated into the Langeberg Complex via contractual agreements:

Thornhill (commonly known as Doornkloof) was purchased by the Leslie Hill Succulent Karoo Trust (administrated by World Wide Fund for Nature – South Africa (WWF-SA)) in 2002 in order to protect the natural veld from further development. There is a formal agreement between CapeNature and WWF-SA whereby CapeNature will manage the property in perpetuity unless decided otherwise by WWF-SA. Since 2002 CapeNature has been engaged in the conservation of the vegetation and fauna indigenous to this property. The property has not yet been declared as a nature reserve, however it is actively managed by CapeNature as part of the Grootvadersbosch cluster.

The following management agreements between CapeNature and other conservation management authorities facilitate protected area management:

- CapeNature has a Memorandum of Agreement (30 November 2017 – 29 November 2022) with the Department of Environmental Affairs (DEA): Oceans

and Coast (now DEFF) specifically related to the management of Stilbaai MPA. CapeNature is the delegated management authority for the MPA.

Land parcels that comprise the Langeberg Complex are listed in Appendix 1 in Table 1 and 2.

The spatial boundaries for the individual land parcels within the CapeNature reserves layers were extracted from the cadastral boundaries spatial layer provided by the Surveyor-General (SG) (Office of the Chief Surveyor-General 2011). According to the Land Survey Act, 1997 (Act No. 8 of 1997), and the South African Spatial Data Infrastructure (SASDI) established as per the Spatial Data Infrastructure Act, 2003 (Act No. 54 of 2003), the SG is the custodian of all cadastral surveying and land information.

Each land parcel boundary was verified against available proclamations and SG diagrams. Any differences between the SG cadastral boundaries and the proclaimed areas or the SG diagrams were corrected accordingly. The areas for each land parcel were calculated using Geographical Information System (GIS) with the projection set to Universal Transverse Mercator, zone 34 south.

2.1.3 Location, extent and highest point

The Langeberg Complex is situated in the Western Cape, South Africa and is approximately 52 413 ha in extent and situated between latitudes 33º 46′ S and 34º 22' S and longitudes 20º 01' E and 21º 35' E. The inland, mountainous section runs along a 155 km east-west gradient between Goedemoed Area (Koo Valley) near Montagu in the North West, in a south easterly direction to Ashton, Swellendam, Suurbraak and north east towards Barrydale and the Gouritz River. An inland to coast linkage is formed along the Goukou River to the Geelkrans Nature Reserve Cluster in the south at Stilbaai and Jongensfontein.

The area is bordered by the R318 at Goedemoed Area; to the south the R60 from Ashton to Swellendam and the N2 from Swellendam to Riversdale; the R324 via Suurbraak and Tradouws Pass to Barrydale, and the R62 from Barrydale via Montagu and Kogmanskloof to Ashton to the north. The R305 runs from the N2 to Stilbaai.

Misty Point in Marloth Nature Reserve is the highest peak in the Langeberg Complex as well as the Langeberg Mountain Range at 1 710 metres above sea level. The second highest peak is Grootberg in the Boosmansbos Wilderness Area at 1 637 metres above sea level.

The location and extent of the Langeberg Complex is illustrated in Appendix 2 Map 1.

2.1.4 Municipal jurisdiction

The Langeberg Complex is situated within the following district and local municipal boundaries:

- Garden Route District Municipality
    - Hessequa Municipality
- Overberg District Municipality
    - Swellendam Municipality
- Cape Winelands District Municipality:
    - Langeberg Municipality

Municipalities within which the Langeberg Complex occurs is illustrated in Appendix 2 Map 1.

2.1.5 International, national and provincial listings

UNESCO World Heritage Site:

The Langeberg Complex (excluding the Geelkrans Cluster) is inscribed as a World Heritage Site as part of the CFRPA World Heritage Site or part of the proposed extension. The CFRPA World Heritage Site comprises a serial property of eight initial protected areas with thirteen in the latest extension, covering a total area of approximately 557 584 ha. Boosmansbos Wilderness Area was included within the initial inscription of the CFRPA World Heritage Site, with the remainder of the Marloth and Grootvadersbosch Clusters included within the proposed extension to the CFRPA World Heritage Site (IVC 2015).

The Langeberg Complex represents outstanding examples of significant ongoing ecological and biological processes in the evolution of terrestrial ecosystems and plant communities (IVC 2003) such as a natural fire regime and natural flow of water through the area, supporting unique indigenous freshwater fish assemblages and agricultural sectors, and connectivity for species migration, gene flow, dispersal, etc.

The Langeberg Complex contains important and significant natural habitats for *in-situ* conservation of biological diversity, including those containing threatened species of outstanding universal value (IVC 2003). The Complex is a centre of endemism for plants, amphibians, small mammals and importantly, endemic and threatened freshwater fish.

UNESCO Biosphere reserve:

The entire extent of the Langeberg Complex forms part of the core zone of Gouritz Cluster Biosphere Reserve (GCBR) that was approved for designation in June 2015. The adjacent Mountain Catchment Areas also form part of the core zone of the biosphere reserve, with the buffer and transition zones surrounding these protected areas.

This biosphere reserve is also the largest in South Africa at 3 187 893 ha and creates an inland - coast corridor centred along the Gouritz River, where naturally occurring indigenous animals and plants could disperse freely from the conservation areas of the inland mountains (Anysberg-Swartberg and Gamkaberg-Rooiberg ranges) to those of the coastal Langeberg-Outeniqua mountains ranges.

2.2 Biophysical Description

2.2.1 Climate

The inland component of the Langeberg Complex is characterised by steep rainfall gradients running from the coastal to inland slopes. The inland, mountainous section of the Complex is situated in the transitional zone where winter rainfall is replaced by rainfall all year round. Precipitation occurs mainly as rainfall throughout the year with peaks in autumn (April) and spring (October). Fogs and mists play a role in precipitation and the lowest mean annual precipitation is about 800 mm in the southern slopes. With an increase in altitude, this value increases to almost 1 300 mm. With a

decrease in altitude on the northern slopes, bordering the Little Karoo, a steep decreasing rainfall gradient exists due to the rainshadow effect, with the lower slopes receiving less than 300 mm mean annual precipitation. Snow occurs in August, September, October and occasionally November (Figure 2.1). Prevailing winds in summer are from the southeast or southwest and winter rains are usually brought in by north-westerly or south-westerly winds. February is the warmest month, while August is the coolest month on average.

The climate of the Geelkrans Nature Reserve Cluster is cool temperate coastal Mediterranean. The climate of the area is strongly influenced by its proximity to the Indian Ocean. The Agulhas Current moderates the air temperatures and an annual mean of 17° C has been recorded. The area experiences typical southern coast weather patterns with an all year round rainfall regime. Within this regime there are distinct summer and winter patterns with separate peaks in rainfall, namely March/April and September/October. The annual average rainfall is between 300 mm and 450 mm.

The mean annual temperature of the Langeberg Complex is shown in Figure 2.2 and the mean annual rainfall in Figure 2.3.

Figure 2.1: Snow on the high mountain peaks in Marloth Nature Reserve (2004). Photo: Adam Nel.

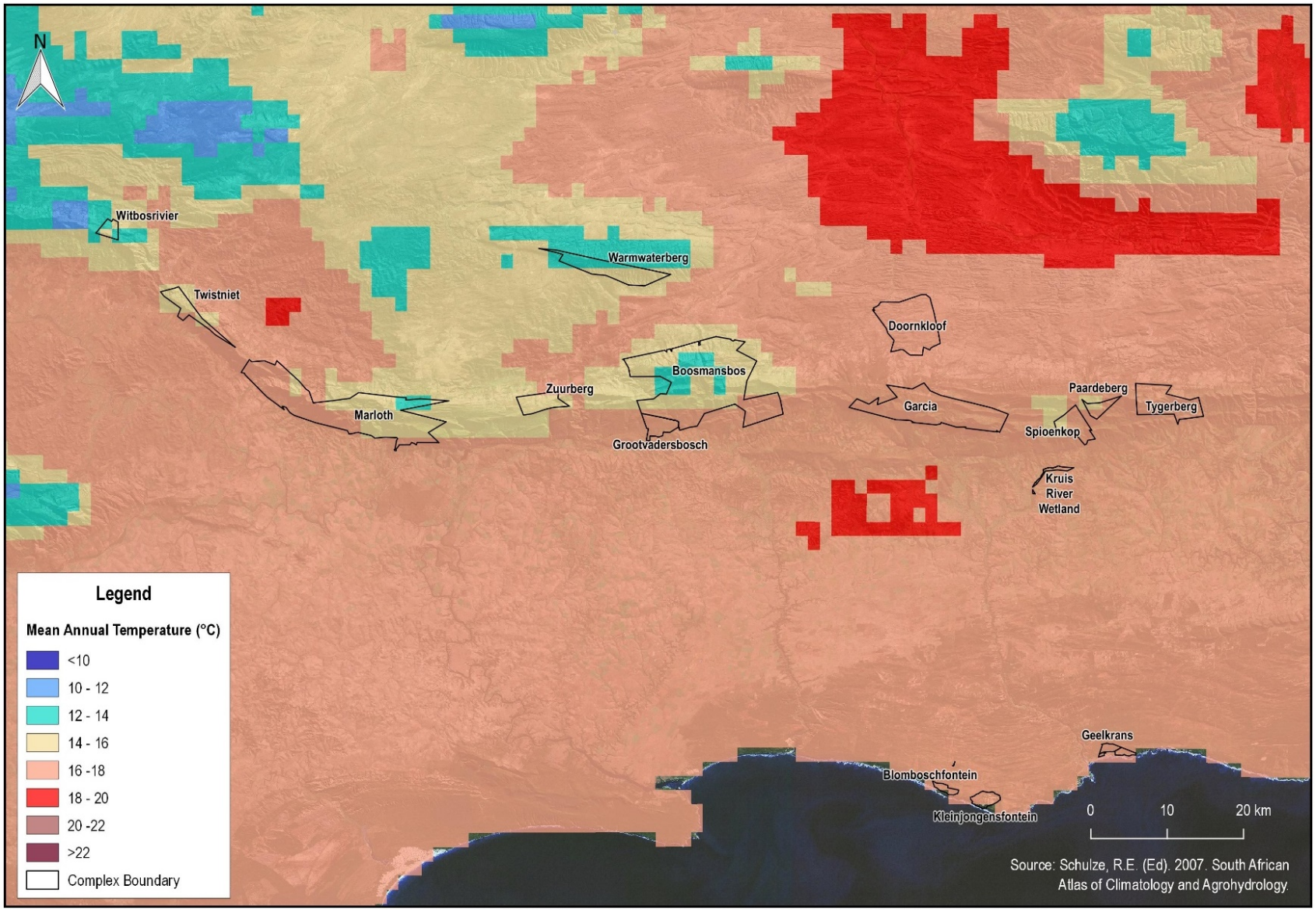

Figure 2.2: Mean annual temperature of the Langeberg Complex.

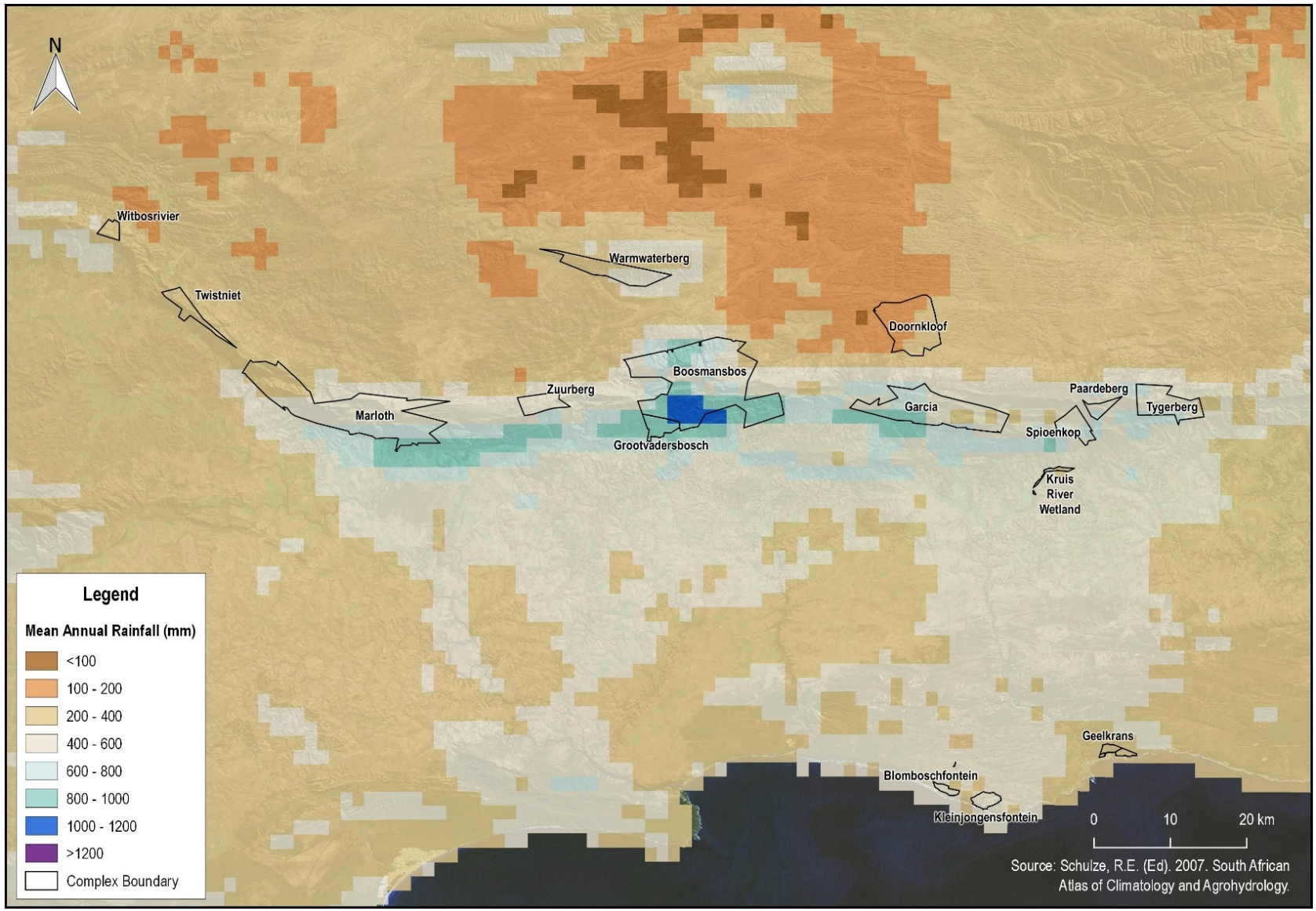

Figure 2.3: Mean annual rainfall of the Langeberg Complex.

2.2.2 Topography

The inland section of the Langeberg Complex is dominated by rugged mountainous terrain with high peaks along the Langeberg Mountain Range (Figure 2.4). It is an east/west trending mountain range with northward-verging folds that is part of the Cape Fold Belt. The core of folding in the Complex is in the region of the Tradouw Pass. The southern aspect slopes have impressive high peaks with relatively steep slopes and numerous ravines. The drier northern aspect slopes are not as steep as the southern slopes, and have lower slope gradients. Misty Peak is the highest peak at 1 710 metres above sea level. Some other high peaks are Grootberg (1 637 m), Leeurivierberg (1 628 m) and Horingberg (1 498 m). The lowest elevations occur along the southern boundary of the Mountain Catchment Area (MCA), at about 170 - 300 metres above sea level.

Figure 2.4: The rugged mountainous terrain of the Langeberg Complex. Photo: Llewellyn Michaels.

The Geelkrans Nature Reserve Cluster lies on the coastal plain within coastal dunes and the topography is relatively flat and low-lying. The sand dunes at Blomboschfontein and Kleinjongensfontein Nature Reserves are approximately 100 m above sea level and in both areas are separated from the sea by the high coastal cliffs.

The topography of the Langeberg Complex is shown in Appendix 2 Map 2.

2.2.3 Geology and soils

A transect over the Langeberg reveals the peculiar local geology, the result of folding, faulting and consequent positioning of strata and fault valleys (Appendix 2 Map 3). These disturbances have exposed a range of rocks including sandstones, shales, conglomerates, and mudstones. Most soils in the area are derived from Table Mountain sandstone but there are isolated pockets of Bokkeveld shales on which the scarce indigenous forests are found (McDonald 1993).

Five formations of the Table Mountain Group are found in the region. The Peninsula Formation sandstone makes up the southern slopes from about 400-1 600 metres above sea level. At 1 150 m the Cedarberg Formation is represented by a relatively thin band of shale. North of the Cedarberg Formation are the sandstones of the Nardouw Subgroup comprising the Goudini, Rietvlei and Skurweberg formations. On the northern side of the range are high terrace gravels which are cemented by a siliceous matrix, forming resistant silcrete caps or duricrusts and are remnants of the African Erosion Surface (McDonald 1993). Gravels of the Enon Formation may be found on the lower southern slopes that consist of vein quartz, quartzite (derived from the Table Mountain Group), greenish sandstones and shales (apparently from the Bokkeveld Group), as well as conglomerates older than the Enon Formation (McDonald 1993).

The geology of the Geelkrans Nature Reserve Cluster consists entirely of the Bredasdorp (late Cenozoic) group, namely the Strandveld (Holocene age), Wankoe and De Hoopvlei Formations (Pliocene age). The Strandveld Formation is by far the most widespread unit, and consists of partly consolidated dune sands of up to 100 m thick. The aeolian Wankoe Formation consists of cross-bedded calcarenite and attains a maximum thickness of 300 m. The De Hoopvlei Formation is a 0.2 to 17-m thick basal marine/estuarine deposit (from the 1: 250 000, Geological Series, 3420 Riversdale, 1993).

The geology in the Blomboschfontein and Kleinjongensfontein area comprises three layers; Table Mountain Sandstone covered by Limestone and then the sand dune topping. The formations of these uplands are tertiary in origin and represents raised beaches with sand of argillaceous material probably derived from the Bokkeveld, Table Mountain Sandstone and Bredasdorp formations. Table Mountain Sandstone occurs above the high water mark and is evident as rocks and kranzes. The limestone level is often exposed by wind erosion.

The geology of the Langeberg Complex is shown in Appendix 2 Map 3.

2.3 Biodiversity Context: Ecosystems

2.3.1 Vegetation

The Core Cape Subregion (previously termed the Cape Floristic Kingdom) has a flora that differs sharply from the immediate surrounds (Manning & Goldblatt 2012). The Langeberg Complex falls fully within the Core Cape Subregion (Manning & Goldblatt 2012).

The Core Cape Subregion is one of the world's smallest but richest floral kingdoms, encompassing a land area of approximately 90 760 km² (less than 4% of the southern African subcontinent). An estimated 9 383 species of vascular plants (ferns and other

spore-bearing vascular plants, gymnosperms, and flowering plants) are known to occur here, of which just over 68% are endemic. The majority of these species are flowering plants. The Core Cape Flora of the Greater Cape Floristic Region is characterised by six endemic or near-endemic families and by the conspicuous presence of Asteraceae and Fabaceae (two largest families), and the Iridaceae, Aizoaceae, Ericaceae, Proteaceae, and Restionaceae (Manning & Goldblatt 2012). The Core Cape Subregion is notable for its range of ecosystems ranging from coastal foredunes through strandveld, lowland and mountain fynbos.

South Africa recognises that different ecosystems have differing species compositions and to effectively conserve biodiversity, the country has set targets for each ecosystem. The biodiversity target is the minimum proportion of each ecosystem type that needs to be kept in a natural or near-natural state over the long term to maintain viable representative samples of all ecosystem types and the majority of species associated with those ecosystems. The biodiversity target is calculated based on species richness, using species–area relationships, and varies between 16% and 36% of the original extent of each ecosystem type (Desmet & Cowling 2004).

Threat status is provided for each ecosystem according to three assessments:

- CapeNature's 2014 assessment of criterion A1 (habitat loss);
- The Western Cape Biodiversity Spatial Plan (WCBSP) Assessment (Pool-Stanvliet *et al.* 2017). This latter category is considered the best available status for the Western Cape Province;
- National Biodiversity Assessment 2018 (SANBI 2018).

The Langeberg Complex supports 19 vegetation types (Mucina & Rutherford 2011) of which two are critically endangered and four endangered (Jacobs *et al.* 2017) (Table 2.1). The Langeberg Mountain range is part of the Langeberg phytogeographical centre with over 2 360 species and endemism at 11.7% (Goldblatt & Manning 2000). Particularly noteworthy is the occurrence of the monotypic family Geissolomataceae and the monotypic genus Langebergia (Asteraceae), both of which are endemic to the Langeberg (McDonald & Cowling 1995).

Full descriptions of vegetation types are given in Mucina and Rutherford (2011) (see Appendix 2 Map 4). Table 2.1 gives a summary of the vegetation types represented in the Langeberg Complex and their protection status (Jacobs *et al.* 2017; Pool-Stanvliet *et al.* 2017). The data were obtained from the latest South African National Biodiversity Institute's (SANBI) Threatened Species Programme.

Table 2.1: Vegetation types conserved by the Langeberg Complex.

Vegetation type	WC Provincial Protection Target (ha)	% of WC target conserved in Langeberg Complex	Ha conserved in Langeberg Complex	Ecosystem Status (2017)
Albertinia Sand Fynbos	22645.88	13.56	3071.83	VU
Blombos Strandveld	2148.44	36.42	782.47	LT
Breede Alluvium Renosterveld	13434.44	3.45	463.15	VU
Breede Shale Fynbos	9541.78	103.92	9916	LT

Vegetation type	WC Provincial Protection Target (ha)	% of WC target conserved in Langeberg Complex	Ha conserved in Langeberg Complex	Ecosystem Status (2017)
Canca Limestone Fynbos	35907.64	0.34	122.42	LT
Cape Lowland Alluvial Vegetation	11134.82	4.12	459.28	CR
Central Coastal Shale Band Vegetation	1853.09	238.52	4420.01	LT
Eastern Ruens Shale Renosterveld	74788.77	0.89	668.51	CR
Garden Route Shale Fynbos	12132.7	11.25	1364.78	VU
Little Karoo Quartz Vygieveld	3839.32	12.77	490.12	LT
Montagu Shale Fynbos	5598.88	11.29	632.03	LT
Montagu Shale Renosterveld	43381.9	11.15	4836.95	VU
Mossel Bay Shale Renosterveld	21488.98	0.73	156.64	EN
North Langeberg Sandstone Fynbos	30840.07	187.61	57858.99	LT
Robertson Granite Fynbos	509.59	137.28	699.58	LT
South Langeberg Sandstone Fynbos	36684.68	252.42	92599.99	LT
Southern Afrotemperate Forest	21774.65	138.45	30147.92	LT
Swellendam Silcrete Fynbos	26035.62	15.56	4051.67	VU
Western Little Karoo	65694.59	65.82	43241.23	LT

Furthermore, 61 fine scale vegetation units are conserved within the Langeberg Complex (Vlok *et al.* 2005; Vlok & De Villiers 2007). The fine scale vegetation units and their areas conserved in the Complex are as follows (see Appendix 2 Map 5). The threat status information is not available for these vegetation units.

Aardvark Quartz Gannaveld (Vlok et al. 2005)

This vegetation unit is quite small and most similar to the Request Quartz Gannaveld, but it differs in several respects. Species such as *Berkeya cuneata* and *Cephalophyllum curtophyllum* are more prominent and heuweltjies are present in the matrix Gannaveld. The succulent species present in the quartz patches also differ with species such as *Gibbaeum cryptopodium*, *Gibbaeum heathii* and *Gibbaeum petrense* (Figure 2.5) present. Some geophytes also occur here, including the uncommon *Tritonia watermeyeri* and an unidentified *Trachyandra* species that may be a localized endemic. Area conserved: 8.09 ha.

Barrydale Arid Proteoid Fynbos (Vlok & De Villiers 2007)

Proteaceae are abundant in this vegetation unit, with *Protea lorifolia*, *Protea repens* and *Leucadendron salignum* prominent and abundant, but a number of other uncommon Proteaceae species also occur here, including *Leucadendron spissifolium* subsp. *spissifolium*, *Leucospermum mundii*, *Paranomus spathulatus*, *Protea cordata*, *Protea lorea* and *Protea subulifolia*. Ericas are not uncommon with *Erica cerinthoides*, *Erica plukenetii* and *Erica vestita* as typical species. Other ericoid shrubs are also abundant, especially *Muraltia heisteria*, with *Adenandra mundiifolia* as one of the more unusual species. Restios are abundant, with *Cannamois scirpoides*, *Hypodiscus aristatus*, *Hypodiscus striatus*, *Rhodocoma fruticosa* and *Thamnochortus cinereus* typical. Succulents occur in rocky sites, including *Machairophyllum albidum*. The localized endemic *Aspalathus verbasciformis* occurs in this unit. Breede Ericaceous Fynbos. Area conserved: 40.63 ha.

Figure 2.5: *Gibbaeum petrense* occurring in Aardvark Quartz Gannaveld. Photo: AnneLise Schutte-Vlok.

Breederivier Perennial Stream (Vlok & De Villiers 2007)

This unit often has pockets of Afromontane Forest present in the narrow upper gorges. *Brabejum stellatifolium* is often abundant in the lower sections, which differentiates it from all the other Perennial Stream units. Along the lower foothills, the streambed is often dominated by *Prionium,* which filters the water and retain it clean. Several species are endemic to the upper seepage zones, including *Erica chlorosepala,*

E.crassisepala, E. ocellata, E. omninoglabra, E. oxyandra, E. podophylla, E. tradouwensis, *Platycaulos acutus* and *Restio peculiaris*. Area conserved: 2317.92 ha.

Buffeljachts Grassy Fynbos (Vlok & De Villiers 2007)

It is the westernmost unit in this habitat type and as in all other cases it is dominated by a well-developed graminoid component, with almost no overstory proteoid shrubs present. Even sprouting species such as *Leucadendron salignum* and *Leucospermum cuneiforme* are never abundant here, indicating that the absence of proteoid shrubs is not due to recent transformation. The local abundance of some weedy indigenous species such as *Anthospermum aethiopicum* and *Stoebe plumosa* indicate that some disturbance has taken place, perhaps the eradication of small forest-thicket patches. *Cliffortia ruscifolia* is often abundant on north facing slopes, as is the case with many other units associated with the Breede River system, but *Elytropappus rhinocerotis* is uncommon on these north-facing slopes. Geophytes are abundant after fire, including uncommon species such as *Cyrthanthus odorus, Gladiolus emiliae* and *Gladiolus engysiphon*. A rare and threatened geophyte, *Cyrthanthus leptosiphon* (critically endangered), is endemic to this unit. Area conserved: 16.22 ha.

Central Langeberg Perennial Stream (Vlok & De Villiers 2007)

This vegetation unit is easily recognized as the upper seepage areas are dominated by short Restio's and Erica's with several local endemics such as *Berzelia burchellii*, *Cliffortia lanceolata*, *Erica tetrathecoides*, *Nevillea* sp. nov. and *Spatalla colorata* present. Lower streams dominated by taller shrubs and Restios such as *Berzelia intermedia*, *Cannamois virgata*, *Erica curviflora*, *Leucadendron salicifolium*, *Otholobium bowieanum*, *Platycaulos compressus*, *Psoralea aphylla* and *Pteronia camphorata*. Typical and restricted to this unit is the very localized *Penaea dahlgrenii*. Some unusual orchid species may be present after fire. Area conserved: 477.21 ha.

Cloetesberg Perennial Stream (Vlok & De Villiers 2007)

These vegetation units drain into the Gourits River drainage system, but it contains species that are typical of both the eastern Moordkuils and western Goukou Perennial Stream units, e.g. *Leucadendron conicum* and *Leucadendron salicifolium*. Even in terms of its dynamics, the Cloeteberg units seem to be intermediate between these two units, but despite lacking unique characteristics, the Cloetesberg units cannot be united with confidence with either the Moordkuils or Goukou units. It differs from the Goukou Perennial Stream in rarely having *Prionium* dominated streambeds well developed and from the Moordkuils Perennial Stream unit in having some differentiating species (such as *Leucadendron salicifolium*) present. It seems to represent an important changeover zone as certain widespread species such as *Psoralea aphylla* reach its easternmost distribution within this unit, while others such as *Agapanthus africanus, Corycium exisum* and *Protea speciosa* do so within its catchment area. No endemics are known, even from the upper seepage areas, but this may be an artefact of rather poor botanical collecting in the area. Area conserved: 313.96.

Doornkloof Gannaveld (Vlok et al. 2005)

This vegetation unit is most similar to the Lemoenshoek Gannaveld, but Ganna (*Salsola aphylla*) is not very prominent in this unit and heuweltjies are sparser. Small patches of quartz gravel are occasionally present, but they are not rich in species. The

shrub component is well developed here, with shrubby leaf succulents such as *Drosanthemum giffenii* abundant and "patient" succulents such as *Senecio radicans* also abundant underneath these and the other common shrubs present in this unit, e.g. *Berkheya spinosa*, *Eriocephalus ericoides*, *Selago geniculata* and *Tripteris sinuata*. *Berkheya cuneata* is occasionally locally abundant where small patches of Apronveld communities are present. Trees are sparse, but a few Gwarrie trees (*Euclea undulata*) are present along drainage lines. Stem-succulents are uncommon but Nenta (*Tylecodon wallichii*) is occasionally present. Geophytes are uncommon, except *Moraea polystachya* that may be locally abundant in disturbed sites. Area conserved: 1 093.07 ha.

Doornkloof Gwarrieveld (Vlok et al. 2005)

Doornkloof Gwarrieveld shares many of its common species with the Springfontein Gwarrieveld, but woody trees and shrubs (mostly only *Euclea undulata*, *Gloveria integrifolia* and *Searsia undulata*) are sparse here. The matrix of Succulent Karoo communities is also dominated by asteraceous shrubs (mostly *Pteronia* species), with *Euphorbia mauritanica*, *Zygophyllum foetidum* and *Zygophyllum morgsana* occasionally prominent on south facing slopes (Figure 2.6). Small quartz pebble patches (usually with *Berkheya cuneata* prominent) are present and they have many small succulents (e.g. *Antegibbaeum fissoides, Cephalophyllum curtophyllum, Conophytum joubertii, Crassula tecta*, etc.), of which some (e.g. *Trichodiadema hallii*) are localized endemic species. Other species of interest in the matrix Succulent Karoo communities are *Euphorbia pillansii* and *Tritonia watermeyeri*. Area conserved: 2 845.61 ha.

Duyvenhoksrivier Perennial Stream (Vlok & De Villiers 2007)

Somewhat similar to the Cloetesberg Perennial Stream unit in being intermediate between the two distinctive units on its western and eastern flanks. It is similar to the Breederivier and Goukou Perennial Stream units in having small pockets of Afromontane forests in the upper ravines and *Prionium* dominated streambeds in the lowlands. It shares some regional endemics, e.g. *Psoralea filifolia*, with the Breederivier and the Goukou Perennial Stream units. Some shared species such as *Brabejum stellatifolium* are present, but they are not as prevalent as they are in Breederivier Perennial Stream units. The same model holds for the upper seepage areas where uncommon species, such as *Nivenia fruticosa*, are also shared with the Breederivier and Goukou Perennial Stream units. This unit is consequently not rich in localized endemic species, but there are some near endemics such as *Empleurum fragrans*. Area conserved: 1 201.43 ha.

Eastern Langeberg Perennial Stream (Vlok & De Villiers 2007)

The vegetation unit is most similar to those of the Central Langeberg perennial stream unit in having species that are reliable indicators of permanently wet sites such as *Berzelia intermedia*, *Cannamois virgata*, *Cyclopia sessiliflora*, *Erica curviflora*, *Leucadendron salicifolium*, *Platycaulos compressus*, *Psoralea aphylla* and *Pteronia camphorata* common and abundant. It differs from the other units in also having *Protea coronata* present, indicating a transition to the Outeniqua perennial stream unit. It furthermore differs in lacking most of the local endemics present in the other units with its own distinctive species such as *Cyclopia dregeana*, *Erica rhodantha* and

Otholobium bowieanum. The very rare orchid *Pachites appressa* occurs in the upper seepage areas. Area conserved: 12.13 ha.

Figure 2.6: Doornkloof Gwarrieveld, taken September 2006. Photo: AnneLise Schutte-Vlok.

Fisantefontein Quartz Asbosveld (Vlok et al. 2005)

Most similar to the Springfontein Quartz Asbosveld in having Asbos (*Pteronia incana*) often the dominant species and Renosterbos (*Elytropappus rhinocerotis*) prominent on south facing slopes in the matrix vegetation. It differs, however, in the species present in the quartz patches with *Gibbaeum angulipes* present in this unit, which also has its own local endemic, *Gibbaeum schwantesii*. The uncommon *Drosanthemum bicolor* and *Euphorbia pillansii* is also occasionally present in the matrix vegetation. Area conserved: 469.41 ha.

Fisantefontein Quartz Gannaveld (Vlok et al. 2005)

This vegetation unit is quite different from most of the other Quartz Gannaveld units in having some heuweltjies present, often with some *Tylecodon paniculata* on the heuweltjies. The matrix of Gannaveld also has Ganna (*Salsola aphylla*) prominent, but it is rich in other species with some rare localized endemic species such as *Euphorbia susannae* present. The quartz gravels are often sparse, but the localized endemic *Gibbaeum angulipes* is often abundant here. Area conserved: 75.74 ha.

Gondwana River and Floodplain (Vlok & De Villiers 2007)

This rather distinctive unit differs from all the other Gourits River related drainage areas in having the mainstream zone with rather deep sandy, quartzitic pebble beds along originate from the upland Enon conglomerates. Surface water flows only seasonally. *Vachellia karroo* is prominent in this unit, but is never dominant. Shrubs such as *Dodonaea angustifolia* and *Passerina obtusifolia* are often locally abundant, but in sites where these shrubs are not abundant grasses and sedges are abundant. The pebble-bed area is rich in geophytes (e.g. *Brunsvigia, Gethyllis, Gladiolus, Moraea, Tritonia,* etc. species). No endemic species are known to occur here, but a particularly odd aspect about this unit is the occurrence of hybrid swarms of species e.g. *Tritonia securigera* X *T. crocata*. Area conserved: 0.29 ha.

Goukou Perennial Stream (Vlok & De Villiers 2007)

Afromontane forest pockets are not as prevalent as they are in the Breederivier or the eastern Moordkuils Perennial Stream units. There are, however, indications that small pockets of forests were more extensive along the base of the Langeberg mountain and perhaps along the lower drainage zones, areas that are currently densely invaded by *Acacia mearnsii*. *Prionium* dominated streambeds are well developed in the lowlands, often with distinctive species such as *Cyclopia maculata* prominent along the outer perimeter. The latter species indicating that periodic fires are an important ecological process that does not seem to operate well currently, as most of the surrounding land is used for intensive agricultural land-use practices. The upper seepage areas are rich in local endemics, including species such as *Berzelia burchellii, B. galpinii* (Figure 2.7)*, Disa subtenuicornis, Erica amicorum, E. cubitans, E.dysantha, E.inclusa, E. ixanthera, E. nematophylla, E. obconica and E. tetrathecoides.* Area conserved: 1 005.19 ha.

Goukourivier River and Floodplain (Vlok & De Villiers 2007)

The Goukourivier River and floodplain unit are very similar to those of the Duyvenhoksrivier River and floodplain unit. The Goukou unit seems to be in better condition as *Prionium* dominated riverbeds are currently still extensive, even in the main drainage channel not far upstream from where the river reaches the sea. It is suspected that Afromontane forests were less prevalent in the recent past in the upper floodplain parts of this river system, but that many small forests that occurred along the foothills of the Langeberg have been decimated. Even some of the present farm names indicate that forests were more prevalent, but going there is futile as only dense stands of *Acacia mearnsii* remain. Fortunately, many of the smaller tributaries of the lower foothills are still intact, mostly as they occur on not easily ploughed quartzitic outcrops (e.g. silcrete hills). In these tributaries, the vegetation is often dominated by graminoids, perhaps an artefact of frequent burning and grazing afterwards. Currently the unit is most easily identified by the occurrence of extensive *Prionium* dominated riverbeds, still extant is an outer fringe of a plant community that is less dependent on perennial surface water that include several Fabaceae, with *Cyclopia maculata* and several *Psoralea* species typical. The latter legumes indicate that periodic fires may be required in this unit to ensure healthy rejuvenation of these species. Ares conserved: 177.61 ha.

Figure 2.7: *Berzelia galpinii* occurring in South Langeberg Sandstone Fynbos. Photo: Vicki Hudson.

Gouritz Drift Sands (Vlok & De Villiers 2007)

Almost devoid of vegetation in its natural state, but is important from an ecological point of view. This is the terrestrial storage of sand that would feed back to the marine system, a sort of "sand in the bank" situation, vital to retain ecological processes in the marine intertidal zone. The majority of Geelkrans, Blomboschfontein and Klein Jongensfontein all fall within this unit. They are all however vegetated with only small areas of open sand. Only one vegetation unit is recognized within the Drift Sands habitat type, Gouritz Drift Sands, as there seems to be no variance in the plant species present. Unfortunately, almost all the current examples of this unit have been severely transformed through the establishment of alien species, mostly *Acacia cyclops*. Area conserved: 1 191.45 ha.

Gouritz Dune Thicket (Vlok & De Villiers 2007)

The Gouritz Dune Thicket occurs mostly as dense stands of woody species, sometimes even with *Euclea undulata* present and then approaching the Valley Thicket habitat type, but diagnostic is the presence of *Aloe arborescens* and absence

of *Aloe ferox*. Interesting is the occurrence of hybrid swarms between these two *Aloe* species where this unit and Valley Thicket units meet, e.g. where the Gourits River cuts through the Aasvoëlberg range. Apart from *Carpobrotus muirii* no endemic plant species are known from this unit, but there are some unusual eco-types not known from other units, such as a very attractive variant of *Gladiolus grandifloras.* Marginal areas of this vegetation type occur in Blomboschfontein & Klein Jongensfontein but only along the coastline. Area conserved: 57.32 ha.

Gouritz Littoral Vegetation (Vlok & De Villiers 2007)

This habitat occurs along the rocky coastline, where the local plant communities vary much, but the total species pool is limited. The vegetation consists mostly of short shrubs and herbs, with species such as *Carpobrotus deliciosus, Chenolea diffusa, Chironia baccifera, Delosperma littorale, Drosanthemum cf. hispidum, Falkia repens, Gazania rigens, Helichrysum tenuifolium, Limonium scabrum, Lycium cinereum, Rhoicissus digitata, Silene primuliflora, Tetragonia fruticosa* and *Zygophyllum uitenhagense* most abundant. Grasses are rarely abundant but *Cynodon dactylon* and *Stenotaphrum secundatum* may be abundant in wet sites. Geophytes are also uncommon, but *Chasmanthe aethiopica* and *Haemanthus sanguineus* may be locally abundant. Trees are absent except a few stunted *Pterocelastrus tricuspidatus*, *Schotia afr*a and *Sideroxylon inerme*. No endemic species are known, but the uncommon *Coleonema album* is occasionally present, often forming very attractive bonsai-like shrublets. Area conserved: 0.79 ha.

Groot River and Floodplain (Vlok & De Villiers 2007)

This vegetation is intermediate between the Touws - and Buffels River and floodplain units. It differs from the Buffels River unit in receiving its supply of fresh water from the Langeberg mountains and from the Touws unit in having had a higher yields of fresh water. Along its inland drainage areas, it often has *Schotia afra* as a prominent tree element, with *Vachellia* (previously *Acacia*) *karroo* less prominent. An interesting feature along the main streambed is the occurrence of the spiny grass *Cladoraphis spinosa* that often occurs with clumps of *Stipagrostis namaquensis* in sandy areas. Area conserved: 97.15 ha.

Grootberg Grassy Fynbos (Vlok & De Villiers 2007)

The Grootberg Grassy Fynbos is distinct in containing a different subset of species, for instance, uncommon species such as *Aloe ciliaris* var. *muirii* and *Eulophia platypetala* that occur on rocky outcrops. It shares other uncommon species such as *Aspalathus florifera* with the more eastern Wolwedans unit. I strongly suspect that the "lost" *Cyrthanthus ochroleucus* occurs here, especially since this species is closely related to *Cyrthanthus* species that are typical of the Eastern Cape Grasslands. If proved to be so, this species will be endemic to this unit. The seemingly odd relationship with the Eastern Cape vegetation is evident through the presence of *Aloe ciliaris* in the unit. Area conserved: 27.01 ha.

Grootvadersbos Forest (Vlok & De Villiers 2007)

Vegetation dominated by trees that form a closed canopy well above ground level (Figure 2.8). The outer perimeter consists typically of an ecotone dominated by shrubs and trees that burn periodically, usually with *Laurophyllus capensis*, *Virgilia* and/or *Widdringtonia nodiflora* abundant. Dense mats of *Gleichenia polypodioides* is often

also present in this ecotone where small Forest patches occur high up in the mountain. The Forest mosaic with Thicket habitat type is mostly located in more lowland areas and here the ecotone is dominated by non-flammable species that also tend to be abundant within the Subtropical Thicket biome, e.g. *Diospyros dichrophylla, Canthium inerme, Gymnosporia buxifolia, Pittosporum viridiflorum* and *Scutia myrtina*. The Grootvadersbos Forest unit is located more towards the west and typically has *Virgilia oroboides* present in the ecotone. *Afrocarpus falcatus* tend to be uncommon in this unit, but that may be an artefact of previous harvesting. Area conserved: 376.55 ha.

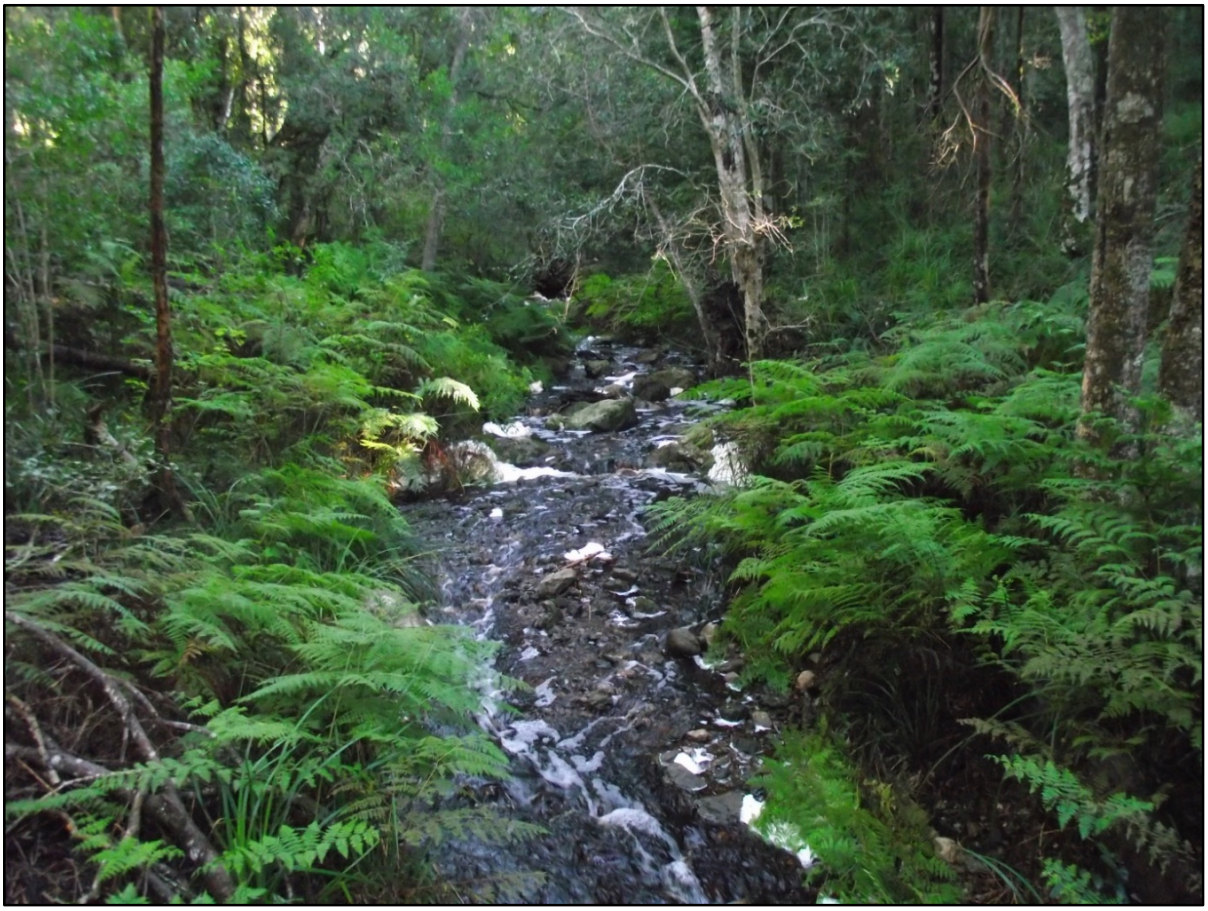

Figure 2.8: Closed canopy forest in Grootvadersbosch Nature Reserve. Photo: Ian Allen.

Grootvadersbos Thicket-Forest Grassy Fynbos (Vlok & De Villiers 2007)

This habitat represents a step up in the rainfall gradient from the previously discussed Grassy Fynbos habitat. It is differentiated from the Grassy Fynbos by the occurrence of often clearly delineated Forest-Thicket communities, but also by the paucity of species in the matrix Grassy Fynbos. The matrix Grassy Fynbos is dominated by grasses (mostly *Eragrostis* and *Pentaschistis* species, but *Themeda triandra* is sometimes also abundant), with even the ericoid shrub component present consisting of a few species. Geophytes also tend to be uncommon, with seemingly only widespread species such as *Babiana patersoniae*, *Gladiolus liliaceus, Ixia orientalis, Moraea tripetala,* etc. present in the Grassy Fynbos. The only known endemic, *Freesia sparmannii*, occurs in the ecotone to the Forest-Thicket vegetation. Area conserved: 44.22 ha.

Harmonie Arid Restioid Fynbos (Vlok & De Villiers 2007)

The Harmonie Arid Restioid Fynbos unit is most similar to the Warmwaterberg Arid Restioid Fynbos, with *Rhodocoma arida* dominant in places and most of the other species present, but it differs in having the fynbos component better developed with some Proteaceae such as *Serruria acrocarpa* present. Area conserved: 10.05 ha.

Hartenbos Primary Dune (Vlok & De Villiers 2007)

The vegetation of this habitat is rather uniform throughout the region and only one vegetation unit is recognized within the Primary Dune habitat, the Hartenbos Primary Dune. Typically, only a few species, *Ammophila arenaria* (alien), *Arctotheca populifolia, Gazania rigens, Hebenstreitia cordata, Ipomoea pes-caprae, Senecio elegans, Scaevola plumieri, Tetragonia decumbens* and *Thinopyrum distichum* are present. The plants tend to be sparse, but just inland (secondary dunes) the vegetation becomes rapidly denser and taller, with shrubs such as *Morella cordifolia, Passerina rigida, Searsia crenata* and often somewhat stunted *Sideroxylon inerme* present. The latter constitute the transition to Dune Thicket vegetation and the cut-off point between these two units is often difficult to determine. The absence of the first mentioned species (e.g. *Scaevola plumieri, Tetragonia decumbens* and *Thinopyrum distichum*) are indicators to differentiate between the Primary Dune and Dune Thicket units. The Primary Dune units acts as a precursor to the Dune Thicket units. Wherever they are absent, often due to stabilization of the supporting Drift Sand unit, wave action starts eating into the secondary dunes, undermining the sands of the Dune Thicket and the homesteads that are often built there. Only one uncommon, but truly remarkable species is present in this unit, *Gladiolus gueinzii*. Area conserved: 9.8 ha.

Hoogfontein Asbos-Renosterveld (Vlok & De Villiers 2007)

This unit is quite peculiar in having Asbos (*Pteronia incana*) and Renosterbos (*Elytropappus rhinocerotis*) so dominant that few other shrubs are present. It may have grass and geophytes abundant after fire, but very few were noted when this unit was surveyed. The vegetation looked moribund and it may benefit from a fire. No rare species are known from this unit, but some unidentified *Antimima* and *Ruschia* species were noted on rocky outcrops. Some of these succulents may be localized endemic species. Area conserved: 18.65 ha.

Kanetberg Ericaceous Fynbos (Vlok & De Villiers 2007)

The structure and most of the common species present in the Kanetberg Ericaceous Fynbos unit are similar to those of the Lemoenshoek Ericaceous Fynbos. It differs, however, in only sharing *Leucadendron radiatum* as a rare species, with other rare and localized endemic species present such as *Acrolophia barbata*, *Erica miniscula* and *Erica vallis-fluminis*. Area conserved: 86.02 ha.

Kanetberg Mesic Proteoid Fynbos (Vlok & De Villiers 2007)

It can be recognized by having the proteoid shrubs present and is rich in species recorded. Rare and localized endemic species recorded in this unit include *Acmadenia nivenii*, *Acmadenia trigona*, *Acrolophia barbata*, *Erica barrydalensis* and *Leucadendron nervosum*. Area conserved: 2 474.94 ha.

Koeniekuils Gannaveld (Vlok et al. 2005)

This vegetation unit is not very species rich. Ganna (*Salsola aphylla*) remains the dominant shrub, often with some Wolwedoring (*Lycium cinereum* and *Lycium ferocissimum*) present. Scholtzbos (*Pteronia pallens*) is often prominent on higher lying areas, along with some other shrubs (mostly *Eriocephalus*, *Pteronia* and *Tripteris* species). Succulents are uncommon, with mostly only *Phyllobolus splendens* present, but *Malephora lutea* is sometimes abundant in disturbed sites. Heuweltjies are not prominent in this unit either. Area conserved: 34.94 ha.

Koktyls Fynbos-Renosterveld (Vlok & De Villiers 2007)

The Koktyls Fynbos-Renosterveld is similar to the Montagu Fynbos-Renosterveld in having the matrix vegetation dominated by Renosterbos (*Elytropappus rhinocerotis*) and in having patches of true fynbos present in which *Leucadendron salignum* and *Thamnochortus erectus* are prominent on deep sandy soils. This unit is also rich in species of all growth forms, but it differs in lacking the rare and localized endemic species present in the Montagu Fynbos-Renosterveld. No endemic species are known from this unit, but will likely be found once it is properly surveyed. Area conserved: 15.38 ha.

Koktyls Renoster-Gwarrieveld (Vlok & De Villiers 2007)

The vegetation unit is similar to the Warmwaterberg Renoster- Gwarrieveld, but here the woody tree component (mostly *Euclea undulata* and *Searsia undulata*) is better developed and often have succulents such as *Crassula arborescens* locally abundant amongst these trees. Renosterbos (*Elytropappus rhinocerotis*) is only common on the upper south facing slopes. The Succulent Karoo communities are also well developed on the lower slopes with shrubs such as *Berkheya spinosa*, *Eriocephalus africanus*, *Eriocephalus ericoides*, *Felicia filifolia*, *Pteronia fasciculata*, *Pteronia flexicaulis* and *Pteronia incana* abundant in the different communities. No rare or localized endemic species are known from this unit, but a more detailed survey will probably reveal some. Area Conserved: 84.07 ha.

Kortefontein Arid Proteoid Fynbos (Vlok & De Villiers 2007)

Proteas, Ericas and Restios are all abundant in the Kortefontein Arid Proteoid Fynbos unit. Rare and localized endemics that occur in this unit include *Acmadenia nivenii, Aspalathus vulpina, Leucospermum saxatile, Metalasia galpinii, Leucospermum saxatile*, *Protea aspera, Stoebe monticola and Thamnochortus ellipticus*. Area conserved: 389.04 ha.

Langeberg Ericaceous Fynbos (Vlok & De Villiers 2007)

Most of the Langeberg Ericaceous Fynbos is quite wet. Several localized endemic species may be present, but this unit is poorly explored botanically. The unit shares several uncommon Ericaceae and Restionaceae species with the Breede Ericaceous Fynbos and several more widespread species (e.g. *Erica deliciosa*) with the more eastern Ruitersberg unit. Area conserved: 1 832.05 ha.

Langeberg Mesic Proteoid Fynbos (Vlok & De Villiers 2007)

The Langeberg Mesic Proteoid Fynbos is a large and heterogeneous unit that occurs along the mid southern slopes of the Langeberg. It is most similar to the Ruitersbos

Mesic Proteoid Fynbos in being dominated by often very dense stands of *Leucadendron eucalyptifolium, Leucadendron salignum, Leucadendron spissifolium, Leucospermum cuneiforme, Mimetes cucullatus, Protea eximia, Protea coronata* and *Protea neriifolia*, but differs in having localized endemic proteoid species such as *Leucospermum winteri* present. Ericoid shrubs are often prominent. Distinctive localized endemic species include *Berzelia burchellii*, *Berzelia galpinii*, *Disa schlechteriana*, *Erica amicorum, Erica atropurpurea, Erica blenna, Erica garciae, Erica grata, Erica macilenta, Erica nematophylla, Erica rhodantha, Erica tetrahecoides* and *Erica winteri*. Area conserved: 3 376.45 ha.

Lemoenshoek Ericaceous Fynbos (Vlok & De Villiers 2007)

The vegetation also dominated by Ericas and Restios with Proteas not very prominent, but several Proteaceae are present including *Leucadendron salignum*, *Leucadendron spissifolium* subsp. *spissifolium*, *Leucadendron tinctum*, *Protea acaulos*, *Protea amplexicaulis*, *Protea cordata*, *Protea cynaroides*, *Protea grandiceps* and *Protea speciosa*. A number of rare and localized endemic species occur here, including *Agathosma umbonata*, *Bobartia parva*, *Grammitis poeppigiana*, *Leucadendron radiatum*, *Spatalla colorata* and *Spatalla nubicola*. Area conserved: 1 095.58 ha.

Lemoenshoek Restioid Fynbos (Vlok & De Villiers 2007)

Structurally very similar to the Montagu Restioid Fynbos, but the species present differs. *Erica barrydalensis* is the only rare species known from this unit. Area conserved: 1 597.35 ha.

Lemoenshoek Sandolienveld (Vlok & De Villiers 2007)

The Lemoenshoek Sandolienveld share many of its species with the Lemoenshoek Restioid Fynbos, with the most prominent difference being that Sandolien (*Dodonaea angustifolia*) is prominent to locally abundant here. Proteas are absent to very rare, but the unit is quite rich in species. The only known rare and localized endemic known in this unit is *Wurmbea compacta*. An unidentified *Adenandra* species collected here may be an undescribed species and perhaps endemic to this unit. Area conserved: 1 454.74 ha.

Marloth Mesic Proteoid Fynbos (Vlok & De Villiers 2007)

The Marloth Mesic Proteoid Fynbos is structurally most similar to the Langeberg Mesic Proteoid Fynbos and also a large heterogeneous unit dominated by often dense stands of *Leucadendron eucalyptifolium, Leucadendron salignum, Leucadendron spissifolium, Leucospermum cuneiforme, Mimetes cucullatus, Protea eximia, Protea coronata* and *Protea neriifolia*. It differs, however, in having proteoid species such as *Serruria balanocephala* and other localized endemic species such as *Erica chartacea, Erica chlorosepala, Erica mundii, Erica omninoglabra, Erica oxyandra, Erica peziza, Erica polifolia* and *Erica pubigera* present. Area conserved: 2 783.04 ha.

Montagu Ericaceous Fynbos (Vlok & De Villiers 2007)

Only small sections of this vegetation occurs in the Little Karoo domain, but it is much more abundant westwards. Ericas and Restios dominate this fairly wet Fynbos unit with tall Proteas not very prominent, but *Protea cynaroides*, *Protea grandiceps* and *Protea speciosa* is present. Several rare and localized endemic species occur here,

including *Calopsis monostylis*, *Erica chlorosepala*, *Leucadendron spissifolium* subsp. *spissifolium*, *Nivenia fruticosa* and *Raspalia barnardii*. Area conserved: 566.89 ha.

Montagu Mesic Proteoid Fynbos (Vlok & De Villiers 2007)

The unit can be easily identified as it has species such as *Aulax pallasia*, *Leucadendron eucalyptifolium*, *Leucadendron salicifolium*, *Leucadendron spissifolium* subsp. *spissifolium*, *Leucospermum calligerum*, *Leucospermum mundii*, *Mimetes cucullatus*, *Protea cordata*, *Protea neriifolia*, *Protea repens*, *Protea grandiceps*, *Protea speciosa* and *Serruria acrocarpa* present as proteoid shrubs. Rare and localized endemic species known from this unit include *Acmadenia laxa*, *Aulax pallasia*, *Bobartia parva*, *Cyrthanthus odorus* and *Paranomus candicans*. Area conserved: 3 599.96 ha.

Montagu Thicket-Waboomveld (Vlok & De Villiers 2007)

Waboom (*Protea nitida*) remains relatively abundant and the distinctive species of this habitat type, which differs from the Waboomveld habitat type in being more arid and having Thicket components (e.g. *Carissa haematocarpa, Cynanchum obtusifolium, Buddleja saligna, Pterocelastrus tricuspidatus,* etc.*)* and succulents (e*.g. Adromischus leucophyllus, Aloe comptonii, Crassula arborescens,* etc.) are abundant on the lower slopes. Grasses are usually prominent (e.g. *Cymbopogon, Ehrharta, Eragrostis, Merxmuelera, Pentameris, Pentaschistis*, etc.) here and restioids (e.g. *Ischyrolepis, Restio, Rhodocoma,* etc.) are less abundant than in other Fynbos habitat types. No species are known to be endemic in this habitat, but uncommon species include *Paranomus candicans* and *Protea subulifolia*. Only one vegetation unit is recognized within the Waboomveld. This unit is not restricted to the Riversdale domain, it continues along the northern slopes of the Langeberg into the Little Karoo domain. Area conserved: 61.25 ha.

Montagu Waboomveld (Vlok & De Villiers 2007)

The presence and occasional local abundance of *Protea nitida* is also the distinctive feature that distinguishes the Montagu Waboomveld from all the adjacent Fynbos units. The grass component (mostly sour grasses such as *Ehrharta ramosa*, *Merxmuellera arundinacea*, *Merxmuellera stricta*, *Pentameris distichophylla*, *Pentameris macrocalycina*, *Pentaschistis eriostoma*, *Pentaschistis malouiensis* and *Pentaschistis pallida*) is also well -developed in this unit. It can be distinguished from all the other Waboomveld units in the rare and localized endemic species present that include species such as *Coleonema virgatum*, *Paranomus candicans* and *Protea subulifolia*. Area conserved: 63.34 ha.

Muiskraal Arid Proteoid Fynbos (Vlok & De Villiers 2007)

This relatively arid habitat type occurs mostly on the more inland north facing slopes of the coastal mountain ranges. Here the overstory proteoid shrubs are rarely dense, with uncommon proteoid shrubs present including *Leucospermum erubescens*, a distinctive species that is absent from all the other vegetation units. Ericoid shrubs are prominent (e.g. *Erica galpinii, Erica anguliger, Erica articularis, Erica plukenetii,* etc.) as well as restioids. Rare species known to be present include *Aspalathus longifolia*, with an *Aspalathus* sp. nov., probably endemic to this unit. Area conserved: 233.68 ha.

Muiskraal Mesic Proteoid Fynbos (Vlok & De Villiers 2007)

Similar to the Kanetberg Mesic Proteoid Fynbos with localized endemics species known to be present in this unit include *Aspalathus grandiflora* and *Otholobium bowieanum*. Area conserved: 139.96 ha.

Plattekloof Thicket-Renosterveld (Vlok & De Villiers 2007)

The Plattekloof Thicket-Renosterveld occurs in a fairly high rainfall area where more frequent fires have reduced the size of Thicket clumps. Much of the Thicket seems to have been replaced by stands of *Searsia lucida* and fire resilient shrubs such as *Otholobium spicatum, Passerina falcifolia* and *Struthiola hirsuta*. The latter species are all abundant on south facing slopes, along with some other fynbos elements (e.g. *Restio triticeus*), including the uncommon, characteristic *Erica cruenta*. As in other cases the unit does not seem to be rich in geophytes, but some common species such as *Tritonia deusta* are present. No endemic species are known to be present, but that may be due to the fact that the few unploughed remnants of this unit is densely invaded by alien trees (*Acacia mearnsii*). On north facing slopes, some succulents, such as *Aloe ferox,* are present and intact examples of these slopes should be further explored, as they look promising as potential habitat for uncommon species. Area conserved: 29.35 ha.

Soutkloof Asbos-Renosterveld (Vlok & De Villiers 2007)

Asbos (*Pteronia incana*) is only prominent on deeper loamy soils, with most of the sparsely vegetated shale ridges having karroid shrubs (e.g. *Berkheya cuneata, Felicia filifolia, Pteronia paniculata*, etc.), some succulents (e.g. *Adromischus filicaulis, Crassula columnaris, Crassula rupestris*, etc.) and a few geophytes (e.g. *Boophane disticha* and *Oxalis* spp.) present. Renosterbos (*Elytropappus rhinocerotis*) is only prominent on south facing slopes, along with some other shrubs, of which some are rare and localized endemics (e.g. *Diosma strumosa* and a seemingly undescribed *Amphithalea* species). A few peculiar populations of *Thamnochortus karooica* (growing on pure shale) were found on southern slopes amongst which a peculiar variant of *Gibbaeum velutinum* was also present. Area conserved: 13.79 ha.

Springfontein Waboom-Renosterveld (Vlok & De Villiers 2007)

Renosterbos (*Elytropappus rhinocerotis*) is the dominant shrub on north facing slopes, but Fynbos elements and Waboom (*Protea nitida*) are prominent on south facing slopes here. Several rare and localized endemic species are also present, including *Acmadenia latifolia, Acmadenia nivenii, Lotononis lamprifolia, Leucospermum erubescens*, *Leucospermum saxatile* and *Protea aspera*. Area conserved: 89.83 ha.

Stonehaven Waboom-Mesic Proteoid Fynbos (Vlok & De Villiers 2007)

This habitat type is very similar to the Mesic Proteoid Fynbos, but differs in having some shale bands present in which Waboom (*Protea nitida*) is often locally abundant. Unlike typical Waboomveld, graminoids are rarely very prominent, but restioids and ericoid shrubs are abundant. The unit is somewhat arid with many of the communities dominated by *Leucadendron eucalyptifolium* and *Protea repens*. The soils are not very humic and are usually very rocky. *Erica vestita* is a prominent ericoid shrub and *Coleonema virgata* is a localized endemic. Area conserved: 1.23 ha.

Swellendam Grassy Fynbos-Renosterveld (Vlok & De Villiers 2007)

This habitat unit represents a step up in moisture gradient from the Mesic Renosterveld Mosaic with Thicket and Fynbos, where the higher rainfall enabled the flammable shrub component to accumulate fuel fast enough to carry regular fires. The Thicket component is consequently absent here and limited to mostly only individual stands of *Searsia laevigata* and *Searsia lucida* on south facing slopes. Grasses (*Cymbopogon, Eragrostis, Pentashistis* species and some *Themeda triandra*) are abundant on north and south facing slopes in the post fire environment, with mostly only *Restio triticeus* present on south facing slopes. *Erica peltata* and *Protea repens* are periodically abundant on the south facing slopes, along with small stands of the uncommon *Protea subulifolia*. *Elytropappus rhinocerotis* is most abundant on the north facing slopes, but not dominant, as *Anthospermum aethiopicum*, *Cliffortia ruscifolia*, *Metalasia* and *Passerina* species are also abundant. Geophytes seem to be uncommon, with only some *Tritonia flabellifolia* and a few widespread *Babiana* species noted. Towards its more arid western end grasses such as *Merxmuellera arundinacea* become dominant on quartzitic outcrops. The latter being of particular interest as these communities extends eastwards through the Little Karoo into the eastern Kouga-Baviaanskloof mountains. No endemic species are known from the unit. Area conserved: 153.29 ha.

Touws River and Floodplain (Vlok & De Villiers 2007)

In the Touws River and floodplain, woody trees, such as *Vachellia karroo*, *Searsia lancea* and *Tamarix usneoides* are often abundant on the riverbanks, while reeds such as *Phragmitis 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 present in the floodplain zone. No rare or localized endemic species are known to occur in this unit. Area conserved: 1.48 ha.

Tradouw Waboom-Mesic Proteoid Fynbos (Vlok & De Villiers 2007)

The Tradouw Waboom-Mesic Proteoid Fynbos occurs in a wetter area with an array of divergent plant communities present. In some communities, the restioid *Cannamois virgata,* is dominant along with *Widdringtonia nodiflora*. Other communities have overstory proteoid shrubs (e.g. *Protea neriifolia*) dominant in which localized endemics such as *Erica tradouwensis* and *Leucadendron tradouwense* are present. An oddity of the unit is that the post-fire environment can be dominated by *Osteospermum* species. Area conserved: 169.33 ha.

Valsrivier Thicket-Renosterveld (Vlok & De Villiers 2007)

The Valsrivier Thicket-Renosterveld is easily identified by the greater presence of Fynbos elements, such as *Leucadendron teretifolium*, in the Renosterveld. *Elytropappus rhinocerotis* is present, but not dominant on south facing slopes, where it seems to be displaced by *Metalasia* and *Passerina* species. The uncommon, but characteristic *Erica cruenta* is also present on south facing slopes. The rare *Erica burchelliana* is a near endemic, shared only with adjacent units in which Fynbos is

more abundant. Grasses are also prominent after fire and the unit is consequently not rich in geophyte species. In wet areas, the Thicket patches become almost forest like, with species such as *Canthium inerme* and *Pittosporum viridiflorum* often abundant. This unit can be confused with the Plattekloof unit, but this unit is somewhat drier and the Thicket patches are better developed than in the Plattekloof unit. Area conserved: 19.61 ha.

Warmwaterberg Arid Restioid Fynbos (Vlok et al. 2005)

Proteas and Ericas are rare or absent in this unit, but *Rhodocoma arida* is locally abundant to dominant in places. The unit is not rich in species, with only a few shrub species present (e.g. *Eriocephalus africanus*, *Euryops rehmanii*, *Felicia filifolia*, *Passerina obtusifolia*, etc.). *Dodonaea angustifolia* and *Elytropappus rhinocerotis* are also present, but they are never abundant. A few succulents (*Aloe comptonii*, *Crassula rupestris*, *Ruschia caroli*, *Smicrostigma viride*, etc.) occur here, but they are not abundant. Grasses (e.g. *Cymbopogon marginatus*, *Pentashistis pallida*, etc.) are present, but not very abundant. A few stunted *Euclea undulata*, *Maytenus oleoides* and *Searsia undulata* trees are occasionally present, but they are never common. The unit is thus somewhat similar to the Touwsberg Fynbos-Gwarrieveld, but here species such as *Crotalaria lebeckioides* are absent, the woody component poorly developed and the Restio component much better developed. Area conserved: 216.26 ha.

Warmwaterberg Grassy Fynbos (Vlok et al. 2005)

The unit is very similar to the Klein Swartberg Grassy Fynbos in its structure, common species present and with *Merxmuellera arundinacea* dominant in places. It is also somewhat similar to the Waboomsberg Grassy Fynbos unit in having a higher shrub component (e.g. *Chrysanthemoides monilifera*, *Cullumia bisulca*, *Erica speciosa*, *Euryops erectus*, *Paranomus dispersus*, *Phylica axillaris*, etc.), but is distinctive as it has rare species such as *Erica barrydalensis* present. Area conserved: 1 149.60 ha.

Warmwaterberg Mesic Proteoid Fynbos (Vlok et al. 2005)

The Warmwaterberg Mesic Proteoid Fynbos is most similar to the Touwsberg Mesic Proteoid Fynbos in having *Leucadendron salignum* abundant on open slopes and some *Leucadendron eucalyptifolium* present in wetter sites, but it differs in having other species present (such as *Cyclopia sessiliflora* and *Leucadendron spissifolium* subsp. *spissifolium*) that are absent from the Touwsberg Mesic Proteoid Fynbos. It shares some rare species with the Proteoid Fynbos of the Langeberg, such as *Leucospermum erubescens*. Area conserved: 680.51 ha.

Warmwaterberg Renoster-Gwarrieveld (Vlok et al. 2005)

The Warmwaterberg Renoster-Gwarrieveld is similar to the Vrede Renoster-Gwarrieveld in having a sparse component of woody trees (mostly *Euclea undulata* and *Searsia undulata*) present in a matrix of asteraceous shrubs in which Renosterbos (*Elytropappus rhinocerotis*) is often prominent on the south facing slopes. Succulent Karoo communities are also present on the lower south facing slopes in which shrubs such as *Berkheya cuneata*, *Berkheya spinosa*, *Eriocephalus africanus*, *Eriocephalus ericoides*, *Felicia filifolia*, *Pteronia paniculata* and *Pteronia incana* are the most abundant species. Neither succulents nor geophytes seem to be abundant in this unit, but some geophytes may appear after rain. No rare or localized endemic species are known from this unit. Area conserved: 404.28 ha.

Waterval Mesic Proteoid Fynbos (Vlok & De Villiers 2007)

The proteoid component present in the Waterval Mesic Proteoid Fynbos is a mix of those that also in the Attaquas - and Waterval Mesic Proteoid Fynbos units It differs, however, in having its own uncommon species present, such as *Leucospermum winteri* that are absent from the other two units. This unit is also rich in species Area conserved: 680.51 ha.

Western Langeberg Renosterveld (Vlok & De Villiers 2007)

Renosterbos (*Elytropappus rhinocerotis*) is also the dominant shrub throughout the Western Langeberg Renosterveld, but other shrubs (e.g. *Dodonaea angustifolia, Eriocephalus africanus, Euryops rehmannii, Freylinia densiflora, Muraltia squarrosa, Oedera genistifolia, Otholobium candicans, Wiborgia tenuifolia*, etc.) are also present. Grasses are present but they are only prominent after a fire. Alien annual grasses (e.g. *Bromus, Hordeum, Lolium*, etc.) have invaded this unit. Some succulents are present (e.g. *Haworthia pumila*), but they are not common. Many geophytes are present, of which some are rare and localized endemic species, e.g. *Babiana patula, Ixia superba* and *Moraea cooperi*. Area conserved: 3.31 ha.

Western Langeberg Perennial Stream (Vlok & De Villiers 2007)

The Western Langeberg perennial stream unit can easily be recognized by an abundance or at least presence of *Leucadendron eucalyptifolium* and/or *Leucadendron salicifolium* amongst the usual other indicator species of perennial streams of the coastal mountains, *Berzelia intermedia*, *Calopsis paniculata*, *Cannamois virgata*, *Carpha glomerata*, *Cliffortia strobilifera*, *Erica curviflora*, *Platycaulos compressus*, *Rhodocoma capensis*, *Psoralea aphylla* and other *Psoralea* species. The only uncommon species known in this unit is *Otholobium bowieanum*, but many others may also occur here. Area conserved: 157.91 ha.

Ystervarkfontein Fynbos-Thicket (Vlok & De Villiers 2007)

The Ystervarkfontein Fynbos-Thicket unit differs from the Hartenbos unit in having the thicket bush-clumps more extensive, with Restios such as *Thamnochortus insignis* much more abundant as well as uncommon species such as *Athanasia cochlearifolia* and *Leucadendron galpinii* in the matrix fynbos. The latter species indicate that the matrix vegetation forms part of the Sandplain Fynbos that is typical of the Albertinia-Riversdale region. *Hermannia muirii* is a threatened species present that may be endemic to this unit. Area conserved: 0.06 ha.

Ystervarkpunt Forest-Thicket-Fynbos (Vlok & De Villiers 2007)

This habitat type is very similar to the former Canca unit, but differs structurally in having clearly defined and often well-developed stands of a Thicket-Forest community present. The combination of species in these bush-clumps is unusual with *Azima tetracantha, Canthium inerme, Gymnosporia capitata, Mystroxylon aethiopicum, Olea europaea* subsp. *africana, Olinia ventosa, Pterocelastrus tricuspidatus, Searsia pterota, Scolopia zeyheri, Sideroxylon inerme* and *Tarchonanthus camphoratus* the most abundant species present. In the understorey of these Forest-Thicket communities occur a number of species that are unusual for the region, e.g. the ground orchid *Habenaria arenaria*. Proteoid shrubs do not dominate the matrix Sandplain Fynbos, but species such as *Leucadendron salignum* and *Protea lanceolata* are

present. Dekriet (*Thamnochortus insignis*) is abundant throughout the unit, but many other ericoid shrubs are also present, some of which are uncommon regional endemics, such as *Aspalathus arenaria* and *Aspalathus sanguinea* subsp. *foliosa*. Annuals are abundant in spring, along with geophytes of which some are rare and threatened taxa, such as *Disa lugens* and *Freesia leichtlinii*. At least one local endemic species is known from the unit, *Moraea* sp. nov.

Fire regime

Fynbos is a fire-driven ecosystem and all Fynbos species require periodic fires to stimulate regeneration and maintain species richness (Van Wilgen & Forsyth 2008; Forsyth *et al*. 2010; Holmes *et al.* 2016). However, in an increasingly fragmented, transformed and risk-averse landscape, natural fire cycles are becoming rare (Holmes *et al.* 2016). Research indicates that globally and within the Cape Floristic Region (CFR), many areas have experienced increases in fire frequency and size (Kraaij & van Wilgen 2014).

Van Wilgen and Forsyth (2008) divided the Western Cape into five fire eco-zones based on the fire potential as defined by climate (Van Wilgen 1984). The northern slopes of the Marloth and Grootvadersbosch Nature Reserve Clusters fall within the eastern inland zone, which experiences a shift from winter-dominated to summer-dominated rainfall as one moves eastwards. A significant seasonal fire cycle exists with most fires occurring in summer due to high evapo-transpiration (Van Wilgen & Forsyth 2008). The south-western coastal zone includes the Geelkrans Nature Reserve Cluster to the crest of the Langeberg mountains, where fire potential is highest in summer but annual fluctuations about the mean are not marked. Fires are most likely to occur under extreme conditions in summer but large fires also occur occasionally in winter during berg wind conditions (Van Wilgen & Forsyth 2008). Fires in the Strandveld are less frequent and less important for species life cycles.

Slow-maturing, serotinous Proteaceae species are used as indicator species to determine acceptable fire return intervals (Van Wilgen *et al*. 1992). These species have been shown to be good indicators for total ecosystem diversity (Vlok & Yeaton 1999 & 2000). The minimum fire return period is dependent on the time it takes before 100% of the slowest maturing non-sprouting Proteaceae species have flowered at least once, or when 50% of the slowest maturing Proteaceae species have flowered at least three times (Le Maitre & Midgley 1992). On the rare occasion when the fire return periods become too long, populations of serotinous Proteaceae will reach senescence, which result in declines in seed production. Short return interval fires that occur before insufficient numbers of serotinous Proteaceae have reached maturity and set seed can lead to population declines or local extinction and cause dramatic structural changes in communities (Van Wilgen 1984; Van Wilgen & Forsyth 2008). It has also been shown that increased fire frequency can benefit sprouting species and that increases in sprouters lead to overall decreases in plant diversity (Vlok & Yeaton 1999).

Within the Langeberg Complex the required fire return interval is more than 15 years on the southern slopes and more than 20 years on the drier northern slopes. The coastal vegetation requires a fire return interval of more than 40 years (A. Schutte-Vlok, Landscape Ecologist, CapeNature, 2019, pers. comm.).

A healthy fire regime is especially important for the Langeberg Complex's ecosystem values. It directly affects the viability of the fynbos mosaic of veld ages. A healthy fynbos mosaic promotes overall ecological health by providing a balanced and diverse vegetation structure; which in turn benefits all the species that depend directly and indirectly on healthy fynbos stands.

Furthermore, a healthy fynbos mosaic within the Langeberg Complex has multiple human well-being benefits, not only within the Complex but extending into the adjacent Zone of Influence and ultimately far beyond its boundaries. Examples of such benefits include security from natural disasters, improved health and sanitation as a result of the production of good quantities of clean water, economic development, supporting tourism-based livelihoods and promoting access to natural resources for neighbouring communities.

2.3.2 Freshwater ecosystems

Mountainous and upland catchment areas are considered important not only for the provision of good quality of water, but also because of the substantial contributions they make to biodiversity (Furse 2000; Dallas & Day 2007). Additionally, they often serve as refuge areas for vertebrate and invertebrate species and in some cases serve as habitat for species that are confined to these upland freshwater ecosystems (Palmer *et al*. 1994; Dallas & Day 2007). This is especially prevalent in the more naturally acidic and low nutrient headwaters of rivers in the CFR, which are underlain by the Table Mountain Group quartzitic sandstones.

The freshwater ecosystems of the Langeberg Complex are shown in Appendix 1 Map 6 and 7.

2.3.2.1 Groundwater

The groundwater systems associated with the Langeberg Complex mainly fall within the Table Mountain Group and Bokkeveld group aquifers which are fractured rock aquifers. There is some intrusion by the Uitenhage group near Grootvadersbosch Nature Reserve and the Malmesbury group and Cape Granite Suite between Montagu and Swellendam. In contrast, the Geelkrans Nature Reserve Cluster is underlain by shallow aquifers associated with the dune fields and the deeper underlying aquifers associated with the Bredasdorp group. Other major formations present in the Langeberg catchment include the Goudini (Table Mountain Group layer which is sandstone and siltstone dominated, between Skurweberg and Peninsula layers), the Cedarberg (shale band in Table Mountain Group; Marloth and Twistniet Nature Reserves) and some Bidouw (subgroup of Bokkeveld group; Grootvadersbosch Nature Reserve).

In the Langeberg Complex the Table Mountain Group aquifer system is formed by the Peninsula- (mainly on south facing slopes), Skurweberg- (mainly north facing slopes) and Rietvlei Formations (northern lower foothills) (Colvin *et al*. 2009). Of these, the Peninsula Formation forms the high mountain ranges and summits in the more southern parts of the area and has the highest recharge potential due to higher precipitation levels (Colvin *et al*. 2009). The Skurweberg Formation sub-aquifer is located on the drier northern lower hillslopes and lower foothill ranges of the area. It therefore has a lower recharge potential.

The Peninsula aquifer contributes mainly to rivers through surface run-off, hillslope interflow and base flow of larger river systems. In many cases, the springs emanating from the confined sections of this aquifer tend to be perennial and thought to be less impacted by groundwater abstraction and seasonal variation (Colvin *et al*. 2009). In contrast, the "shallower" Skurweberg sub-aquifer is more responsive to precipitation events and has more unconfined sections, leading to lower water volumes and more seasonal springs. Seep wetlands in the mountains are often fed by these aquifers.

The Marloth Nature Reserve Cluster is underlain by major aquifer types (high yielding systems of good quality water) (Parsons & Conrad 1998; DWAF 2012). Major aquifer types, with larger areas of minor (moderate yield of variable water quality) and poor (low to negligible yield of moderate to poor water quality) aquifers are present in the foothills and lower lying areas of the catchments between Swellendam, Barrydale, Heidelberg and Riversdal. The Geelkrans Nature Reserve Cluster in the south, along the coast, is shown to be underlain by intergranular, major aquifer type, with yields varying from 0.5 to 2.0 L/s (DEA&DP 2011).

2.3.2.2 Rivers

The Langeberg Complex spans five discrete catchments. These are the Breede system to the west, the Gouritz system to the north and east, the Duiwenhoks and Goukou systems to the south and the Blombos catchment at the coast. The Breede and Gouritz systems amalgamated into the Breede-Gouritz Water Management Area. The Complex (excluding the Geelkrans Nature Reserve Cluster) is a high water yield area and is considered to be one of the national Strategic Water Source Areas (WWF-SA 2013a & b) (see Appendix 2 Map 6). This catchment provides good quality water for local urban areas, including the towns of Swellendam, Barrydale and Heidelberg.

No major river systems have been mapped to occur within the Geelkrans Nature Reserve Cluster. However, there are some small water courses draining from the dune system on the Kleinjongensfontein Nature Reserve directly to the coast, possibly indicating the presence of natural springs.

The variation in environmental conditions in the area result in a number of river types which range from slightly peat-stained, fast-flowing mountain streams with cobble beds, dense riparian zones and closed or semi-closed canopies to more turbid and typical "karoo" type rivers (Figure 2.9). Most of the watercourses within the Langeberg Complex are upper catchment mountain streams. Exceptions to this include the Kruis River Wetland Nature Reserve. The south-western section of the Gouritz catchment is especially dry and most of the rivers in this area are ephemeral systems which only flow periodically after heavy rain. Extensive agricultural development in the region, especially in the Breede River system, has resulted in many river reaches outside of protected areas severely affected by water over-abstraction and agrichemical pollution. A number of alien invasive plants are common in the project area and many rivers, especially those outside of protected areas, have riparian zones dominated by non-native plants. These plants include wattle (*Acacia spp.*), pines (*Pinus spp.*), oleander (*Nerium oleander*) and hakea (*Hakea spp.*). Similarly, alien and invasive fish

species are present in most of the rivers in the region and often dominate foothill and mainstream river reaches.

Figure 2.9: Examples of typical river types associated with the Langeberg Complex. Left is the Klippe River upstream of Swellendam, a typical headwater stream while on the right, the Gouritz River is an example of a lowland Karoo type river. Photo: Martine Jordaan.

Many of the river catchments found within the Langeberg Complex have been identified as priorities for the conservation of different aspects and inhabitants of the freshwater ecosystem through the National Freshwater Ecosystem Priority Areas (NFEPA) projects (Nel *et al.* 2011a & b) (Table 2.2). The NFEPA status and estimated health condition of the Langeberg Complex rivers are given in Table 2.2 and shown in Appendix 2 Map 7.

Table 2.2: The NFEPA status and estimated health condition of the rivers of the Langeberg Complex, from west to east. Health scores are defined as follows; natural (A), good-natural (AB), good (B), fair (C), degraded (D). Condition values are estimated through a combination of real data, desktop study and specialist input.

River	Condition*	NFEPA status	River reach/type
Marloth Nature Reserve			
Nooitgedag	AB	Migration corridor	Mountain stream - foothills
Middel	AB**	Migration corridor	Mountain stream - foothills
Upper tributary of Dwarriega	AB***	No NFEPA status	Mountain stream
Unnamed tributary of Leeu	AB***	Fish Support Area	Mountain stream
Leeu	AB***	Fish Support Area	Mountain stream
Keurbooms	AB***	Upstream area	Mountain stream - foothills
Klip	AB***	Upstream area	Mountain stream - foothills
Koringlands	AB***	Upstream area	Mountain stream - foothills
Wamakersbos	AB***	Rehab NFEPA	Mountain stream - foothills
Upper tributaries of Groot	AB***	Upstream area	Mountain stream -foothills
Twistniet Nature Reserve			

River	Condition*	NFEPA status	River reach/type
Fransina (tributary of Kingna)	AB**	No NFEPA status	Mountain stream
Unnamed tributary of Kogmans-kloof	AB**	No NFEPA status	Mountain stream - foothills
Unnamed tributary of Sarah	AB**	No NFEPA status	Mountain stream
“Running stream”	AB**	No NFEPA status	Mountain stream
Sand	AB**	No NFEPA status	Mountain stream
Witbosrivier Nature Reserve			
Witbos	AB**	No NFEPA status	Mountain stream
Unnamed tributary	AB	No NFEPA status	Mountain stream
Vals	AB	Migration corridor	Mountain stream
Zuurberg Nature Reserve			
Unnamed tributary 1 of Tradouw	AB***	Fish Rehab NFEPA Rehab NFEPA	Mountain stream - foothills
Unnamed tributary 2 Tradouw	AB***	Fish Rehab NFEPA Rehab NFEPA	Mountain stream - foothills
Unnamed tributary 3 Tradouw (Tradouw pass)	AB	Fish Rehab NFEPA Fish Support Area Rehab NFEPA	Mountain stream
Grootvadersbosch Nature Reserve			
Tributaries of Grootvadersbosch River	AB-B	Fish Rehab NFEPA Upstream area Rehab NFEPA	Mountain stream
Unnamed tributary of upper Duiwenhoks River	AB	NFEPA Fish sanctuary	Mountain stream
Boosmansbos Wilderness Area			
Duiwenhoks (western tributary)	AB**	NFEPA Fish sanctuary	Mountain stream
Klip (Noukrans) (eastern tributary of Duiwenhoks)	A**	NFEPA Fish sanctuary	Mountain stream
Unnamed tributary of Duiwenhoks (eastern tributary)	A**	NFEPA Fish sanctuary	Mountain stream
Buffelsbos	AB	NFEPA Fish sanctuary	Mountain stream
Palmiet	A**	NFEPA Fish sanctuary	Mountain stream
Keur	AB	NFEPA Fish sanctuary	Mountain stream
Brand	AB	Upstream area	Mountain stream - foothills
Several unnamed tributaries of Doring River	AB	Upstream area	Mountain stream

River	Condition*	NFEPA status	River reach/type
Doring	AB-B	Fish Rehab NFEPA Fish Support Area Rehab NFEPA Upstream area	Mountain stream - foothills
Huis	AB	Fish Rehab NFEPA Fish Support Area Rehab NFEPA	Mountain stream
Warmwaterberg Nature Reserve			
Unnamed tributaries of the Doring River	AB**	Upstream area	Mountain stream (non-perennial)
Bakoond se Leegte	AB**	No NFEPA status	Mountain stream (non-perennial)
Thornhill (Doornkloof) Nature Reserve			
Doringkloof River (and tributaries)	C	Upstream area	Lower foothills – lowland area
Unnamed tributary of Brand River	B**	NFEPA catchment	Lower foothills – lowland area
Klein-Piets	B-C**	Upstream area	Mountain stream
Garcia Nature Reserve			
Doringkloof (upper)	AB	Upstream area	Mountain stream
Piets	AB	Upstream area	Mountain stream
Tributary of Kruis River	AB**	Fish Support Area	Mountain stream
Kruis (middle)	C	Fish Support Area	Foothills
Meul	AB	NFEPA catchment	Mountain stream
Vet	AB	NFEPA catchment	Mountain stream
Korinte	AB	NFEPA catchment	Mountain stream
Rooiwaterspruit	AB	NFEPA catchment	Mountain stream
Unnamed tributary of Duiwenhoks (source zone)	AB	NFEPA Fish sanctuary	Mountain stream
Spioenkop Nature Reserve			
Kruis (source zone)	AB**	Fish Support Area	Mountain stream
Goukou (source zone)	A**	NFEPA catchment	Mountain stream
Kruis River Wetland Nature Reserve (Broomvlei)			
Goukou	AB-B	NFEPA catchment	Foothills
Paardeberg Nature Reserve			
Unnamed tributaries of Goukou River (source zone)	A	NFEPA catchment	Mountain streams
Weyers	A**	Fish Support Area	Mountain stream

River	Condition*	NFEPA status	River reach/type
Unnamed tributaries of the Weyers River	AB	Fish Support Area	Mountain streams
Tygerberg Nature Reserve			
Bergfontein (tributaries of the Weyers River)	AB	Fish Support Area	
Huis (tributary of the Wabooms River)	AB	NFEPA catchment	Mountain streams
Kleinjongensfontein Nature Reserve			
Unnamed water courses	B**	No NFEPA status	Lowlands (coastal)

**Condition estimated through a combination of real data, desktop study and specialist input.*
***Condition unknown, but expected value given.*

2.3.2.3 Wetlands

A mosaic of wetland types, including the sensitive hillslope seeps and valley-bottom wetlands, form part of the freshwater ecosystems found within the Langeberg Complex. Some of these wetlands are dependent on groundwater and/or aquifer water sources and may also contribute to the sustained base flow in many of the perennial rivers of these catchments. These catchments also serve as important recharge zones for the aquifers underlying the mountains and lower lying areas.

Wetlands are one of the most threatened freshwater ecosystems globally, especially those located in the lowland areas (Gouws *et al.* 2012; Gouws & Gordon 2017). Despite these levels of threat, they continue to be the least studied and monitored freshwater ecosystem in the country. Few wetlands have been mapped within the boundaries of the Langeberg Complex due to the drier climate experienced towards the Karoo (Nel *et al.* 2011a & b). Twistniet Nature Reserve contains some hillslope seeps and channelled valley-bottom wetlands (see Ollis *et al.* 2013 for wetland type descriptions), which are in a good health condition and consists of the Southern Shale Band wetland vegetation type. For this wetland vegetation type, the seeps are considered to be least threatened and well protected, while the channelled valley-bottom wetlands are critically endangered and poorly protected (Gouws *et al.* 2012).

Marloth Nature Reserve Cluster has NFEPA wetlands that are associated with the perennial and non-perennial water courses that drain the mountain slopes. The wetland types include higher and lower altitude seeps, the odd channelled valley-bottom and bench flats on the Marloth and Zuurberg Nature Reserves. The wetland vegetation types vary from being Southern Sandstone Fynbos (Marloth Nature Reserve) to East Coast Shale Renosterveld (Marloth and Zuurberg Nature Reserves). The threat statuses of most of the mapped wetlands are considered to be least threatened and well protected (Nel *et al.* 2011a & b; Gouws *et al.* 2012).

The south facing slopes of the Warmwaterberg Nature Reserve contains some hillslope and valley-head seeps, which feed into channelled valley-bottom wetlands. The vegetation type for these wetlands is Rainshadow Valley Karoo. The seeps are classified as endangered and moderately protected, while the channelled valley-bottoms are critically endangered and poorly protected.

The wetlands associated with the Duiwenhoks River system within the Boosmansbos and Grootvadersbosch Nature Reserves include both bench flats and hillslope seeps, which feeds into the channelled valley-bottom systems. The vegetation type for these wetlands is Southern Silcrete Fynbos. The flats and seeps are classified as least threatened and well protected, whereas the valley-bottom wetlands are critically endangered and poorly protected. Some seep wetlands drain towards the north on these nature reserves, with the wetland vegetation type here being demarcated as Rainshadow Valley Karoo (endangered and moderately protected).

In the Garcia Nature Reserve, Southern Sandstone Fynbos bench flats, hillslope seeps and channelled valley-bottom wetlands are interspersed between East Coast Shale Renosterveld seeps and channelled valley-bottom wetlands associated with the Korinte River, which are least threatened and well protected. The Kruis River travels through an extended Southern Sandstone Fynbos seep wetland system, which includes the Kruis River Wetland Nature Reserve, between Spioenkop and Garcia Nature Reserves.

According to the NFEPA wetlands spatial layer data, the majority of the wetlands mapped within protected areas are in a good to natural condition. However, wetlands outside of the protected areas are either modified, degraded or transformed. Rehabilitation projects of the Working for Wetlands Programme have focussed on the Duiwenhoks and Goukou River systems, both of which are associated with palmiet-dominated channelled valley-bottom systems for much or their upper and middle reaches (Working for Wetlands Programme 2015).

Appendix 2 Maps 6 and 7 depicts the NFEPA wetlands in the Langeberg Complex in relation to the strategic water source area and NFEPA status.

2.3.3 Marine and coastal systems

The marine and coastal systems in the Langeberg Complex is constituted by the Stilbaai MPA and the Goukou estuary.

2.3.3.1 Estuarine Ecosystems

The Goukou Estuary (Figure 2.10) is located on the Indian Ocean seaboard and covers approximately 250 ha, is 19 km in length, and is embedded in a deep valley. The Goukou Estuary is a permanently open system, which means the link between the Goukou River and the ocean is almost never broken. A permanently open estuary mouth is relatively rare in South Africa and the Goukou Estuary is one of four permanently open estuaries between Cape Agulhas and Mossel Bay (CSIR 2011). Owing to its nature, the Goukou Estuary is host to a wider range of marine and estuarine species than temporarily open systems (CSIR 2011).

A large beach lies behind a sandspit on the eastern bank. The sandpit and adjacent beach were previously stabilised with Port Jackson (*Acacia saligna*). The Goukou Estuary was rated 32nd in terms of its conservation importance in Turpie and Clark's (2007) updated estuarine importance rating for all South African estuaries. The land adjacent to the estuary is mostly holiday accommodation and the estuary is primarily utilised for recreation (River Health Programme 2007; CSIR 2011).

Figure 2.10: The Goukou estuary. Photo: Jean du Plessis.

The hydrodynamic regime of the Goukou Estuary is governed mainly by tidal action and river inflow. In addition to the direct river run-off to the estuary, there are also numerous fountains and seeps that provide supporting freshwater habitats and associated freshwater micro-habitats along the length of the estuary. The system is flood tide dominated with the flood tide being of significantly shorter duration than the ebb tide. The tide ranges from about 1.0 m at spring tide to about 0.5 m at neaps. The lower reaches of the estuary (below the bridge) are well flushed by seawater during each tidal cycle, while the middle reaches tend to form a high retention zone, especially above the sand bank at the caravan park which acts as a significant constriction to tidal flows. In summer, the upper reaches of the estuary can be nearly stagnant in the absence of river inflow, while they can be well flushed by river water during periods of high flow (CSIR 2011). The middle reaches of the system are characterised by area of deeper water (> 2 m MSL) which acts as retention areas for saline and nutrient-rich water. The mouth (and lower reaches) of the system can become somewhat constricted during prolonged periods of low river flow. This reduces the tidal action

and associated tidal flushing. This obstruction to tidal flows is normally removed as soon as river inflow increases and sediments are carried from the lowermost reaches of the mouth (CSIR 2011).

The important macrophyte habitats found in the Goukou Estuary are the salt marsh, reeds and sedges and submerged macrophytes. The sand and mud banks which form part of the intertidal zone is regularly flooded by freshwater inflows. This habitat provides a possible area for microphytobenthos to inhabit (DWS 2015). Macroalgae attaches itself as epiphytes to intertidal vegetation and can also occur on rocky substrates.

Submerged macrophytes are rooted in both soft subtidal and low intertidal substrata with their leaves and stems being completely submerged for most states of the tide. The most notable submerged macrophyte species recorded for the Goukou Estuary are *Zostera capensis* and Pondweed (*Stuckenia pectinata*), which is indicative of brackish conditions. Salt marsh species were typically found to follow a gradient and the most common species found in the Goukou Estuary include *Poecilolepis ficoidea*, *Bassia diffusa*, *Cotula coronopifolia*, *Disphyma crassifolium*, *Limonium linifolium*, *Samolus porosus*, *Sarcocornia natalensis*, *Sarcocornia pillansii*, *Spartina maritima*, *Sporobolus virginicus*, *Trilochin striata*, *T. buchenaui* and *T. elongata*. The following reeds and sedges have been recorded in the Goukou Estuary, *Juncus kraussii*, *Phragmites australis* and *Schoenoplectus scirpoideus*. Freshwater seepage results in pockets of *P. australis* occurring at certain sites along the estuary. The salt tolerant grass, *S. maritima*, grows in front of the reeds. The floodplain is mostly a grassy area which occurs within the 5 m contour line. It also includes the dune vegetation at the mouth and riparian vegetation along the middle and upper reaches of the area although most of the floodplain area is degraded.

2.3.3.2 Marine Ecosystems

The Stilbaai MPA represents features of the warm-temperate south coast and encompasses the Goukou Estuary, sandy beaches, rocky shores and a shallow sandstone shelf (Tunley 2009). The MPA falls within the Agulhas Ecoregion (Sink *et al.* 2012). Classification of biogeographic zones is influenced by habitat types and Stilbaai MPA has the following habitat types: Agulhas dissipative-intermediate sandy coast, Agulhas estuarine shore, Agulhas mixed shore, Agulhas exposed rocky coast and Agulhas Intermediate sandy coast (Sink *et al.* 2012).

Stilbaai sandy beach ecosystems include all three typical zones, namely the surf zone, the beach including the intertidal and backshore zones and the dunes, made up of small, recently formed foredunes and large established backdunes (Du Toit & Attwood 2008). Both processes associated to sandy beaches is evident at Stilbaai, namely the occurrence of littoral transport of sand in the surf zone as well as transport on the landward side, where the sand is then trapped by the plants growing near the driftline and which have resulted in the development of the foredunes. Cycles of erosion and accretion are not well defined as the sandy beach is well protected by rocky promontories. Typical meiofauna include nematodes, copepods and ostracods; zooplankton include ghost crabs, plough snails and sandhoppers (Du Toit & Attwood 2008).

The Agulhas exposed rocky coast has all four zones and associated groups of plants and animals present at Stilbaai MPA. These four zones are the Littorina zone with

animals such as *Littorina* snails; the upper Balanoid zone with winkles and limpets; lower Balanoid zone supports brown mussels, corraline seaweeds and green zoanthids at mid-level and the infratidal zone supports anemones, sea urchins and starfish at low tide level. Stilbaai is located in the South Coast, an intermediate, temperate zone, which contains a high proportion of species that are unique to South Africa.

Stilbaai MPA has a number of sub-tidal reefs that are home to a number of fish species, including numerous overexploited species. This habitat type supports a large range of species including high numbers of sharks, rays, fish, marine mammals and birds.

2.4 Biodiversity Context: Taxa

2.4.1 Invertebrates

2.4.1.1 Terrestrial invertebrates

The core of the CFR represents a distinct zoogeographic zone, the Cape Faunal Centre (Stuckenberg 1962), characterised by the phylogenetic antiquity of much of its invertebrate fauna. The component species of this Centre represent what is probably the richest known assemblage of post-Gondwanan relict species and is a pronounced hotspot for faunal endemism within southern Africa, where high levels of endemism are characterised for virtually all taxa examined. The diversity of component invertebrate groups that define the CFR begin to decrease eastwards of the Langeberg Complex. In addition to the vital roles invertebrates play in ecosystems (McGeoch 2002; Samways *et al.* 2010 & 2012), such as primary production, nutrient recycling, predation, herbivory, competition, the Cape flora is dependent on specialised pollination guilds and insect-driven ecological processes such as myrmecochory (seed dispersal by ants) (Le Maitre & Midgley 1992). In South Africa, myrmecochorous plants are mainly restricted to the Fynbos biome and approximately 20% of the strictly Fynbos plant species are dependent on myrmecochory for their survival (Johnson 1992). A total of 29 families and 78 genera of Fynbos plants have been identified as containing species that are ant-dispersed (see Table 1 in Bond & Slingsby 1983).

The presence of a diversity of *Colophon* beetle species in the Langeberg Complex is considered to be indicative of the capacity of this area to provide refuge to biodiversity during periods of climate change. The high altitude peaks of the Complex provide habitat for four *Colophon* beetle species (including the Endangered *Colophon barnardii* and *C. thunbergi,* the Near Threatened *C. izardi,* and *C. oweni*, which is not listed) as well as other palaeogenic groups. These flightless stag-beetles are considered to be relictual fauna with Gondwanaland linkages, since their closest relatives are today found in Brazil and Australia (Endrödy-Younga 1988). These species are under threat due to illegal harvesting by collectors and from climate change.

The butterflies of South Africa were recently assessed according to the latest International Union for Conservation of Nature and Natural Resources (IUCN) criteria as part of the South African Butterfly Conservation Assessment project (Mecenero *et al.* 2013). There are 38 species of Lepidoptera that are endemic to the Western Cape.

Mecenero and others (2013) argued that, in the South African context, it is not just the threatened taxa that are of importance, but also those taxa that are intrinsically rare or localised but not currently threatened. Conservationists should be made aware of these taxa so that future threats can be identified timeously and the species monitored for change. Mecenero *et al.* (2013) assigned conservation status to butterfly species that were classified as Least Concern during Red Listing but has local rarity. These species were either classified as Extremely Rare (known from only one site) or Rare. Rare species were further classified as Rare – Restricted range (those with a range less than 500 km²), Rare – Habitat specialist (species restricted to a specific micro-habitat) or Rare – Low density (species with small subpopulations or single individuals scattered over a wide area). Table 2.3 gives the classification of the three Western Cape species that are likely to occur in the Langeberg Complex that are classified as Least Concern with local rarity.

One of these species, a subspecies of the forest emperor butterfly (*Charaxes xiphares occidentalis*) (Figure 2.11) is classified as extremely rare (Mecenaro *et al.* 2013) and known from only one site in the Grootvadersbosch Nature Reserve, where it is not threatened. It is endemic to the area and only occurs in Southern Afrotemperate Forest habitats.

Table 2.3: Conservation status of butterfly species that are likely to occur in the Langeberg Complex that were classified as Least Concern during Red Listing but are locally rare (Mecenero *et al.* 2013).

Species	Common name	Distribution
Extremely Rare (known from only one site)		
Nymphalidae		
Charaxes xiphares occidentalis	Western forest-king charaxes	Grootvadersbosch, Swellendam. Southern Afrotemperate Forest.
Rare - Restricted range (Range less than 500 km²)		
Lycaenidae		
Thestor pictus	Langeberg skollie	From Barrydale to Riversdale along the Langeberg mountains in South Langeberg Sandstone Fynbos.
Rare – Habitat specialists and Low density		
Lycaenidae		
Lepidochrysops bacchus	Wineland blue	Occurs in Fynbos and Albany Thicket localities that receive between 500 mm and 750 mm rainfall per annum.

Figure 2.11: The forest emperor butterfly (*Charaxes xiphares occidentalis*) male (left) and female (right). Photo: Keir and Alouise Lynch, Bionerds PTY Ltd.

The South African National Survey of Arachnida was initiated in 1997 (Dippenaar-Schoeman *et al.* 2015) and 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. This National Survey 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). Presently 71 spider families, 471 genera and 2240 species are known from South Africa, representing approximately 4.8% of the world fauna. A total of 966 species represented by 365 genera and 68 families have been recorded in the Western Cape (Dippenaar-Schoeman *et al.* 2015) of which 361 species are endemic to the Western Cape (37.4%), with 119 species only known from their type locality. Unfortunately, there is no spider species list available for the Langeberg Complex, but given the information generated by the National Survey, it is likely that there might be endemic spider species in the reserve complex. Further details will be added for the Complex as soon as the South African Spider Atlas (Dippenaar-Schoeman *et al*. in preparation) is published.

Main threats to invertebrate populations include habitat destruction and invasive alien plants. This critically important group can be protected by managing ecosystems according to the required fire regimes and by removal of invasive alien plants, especially in river courses.

The Polyphagous Shot Hole Borer (*Euwallacea whifordiodendrus*) is an ambrosia beetle native to Southeast Asia. In 2017 it was first detected in the KwaZulu-Natal National Botanical Gardens. Its presence has since been confirmed in Durban, Bloemfontein, George, Knysna and Johannesburg. It has a symbiotic relationship with the fungus *Fusarium euwallaceae* which serves as a food source for adults and their larvae. The fungus causes Fusarium dieback in susceptible trees which can lead to branch dieback and trea death. The beetles attack both exotic and indigenous trees in urban, agricultural and natural landscapes (De Beer & Paap 2019).

This beetle has not been found within the Langeberg Complex, but has been found in the Western Cape at certain locations. It presents a threat to indigenous trees, and is therefore of particular concern in the Southern Afrotemperate Forest patches within the Complex, such as at Grootvadersbosch.

2.4.1.2 Aquatic Macro-Invertebrates

The naturally acidic and low nutrient headwaters of rivers in the Langeberg Complex have resulted in high aquatic species richness and also high degrees of endemism (Gouws & Gordon 2017; De Moor & Day 2013). Aquatic macro-invertebrates are highly sensitive to environmental change and are thus used extensively as indicators of river health (Dickens & Graham 2002).

Several of the South Western Cape endemic insect families occur in the naturally acidic tannin-stained, sandstone base rivers (e.g. Klip River, Marloth Nature Reserve). These endemics included species of the mayfly family Teloganodidae (upper Huis River, Klip River, Keurbooms River, Leeu River, the Glen River, the upper Duiwenhoks and the Klip River) and the cased caddisfly families Barbarochthonidae (Klip River and upper Duiwenhoks), Glossosomatidae (Nooitgedag River, Leeu River and the Klip River) and Sericostomatidae (Leeu River, the Glen River, the upper Duiwenhoks and the Klip River). Recent work on the phylogenetics of Teloganodidae mayflies has improved the knowledge regarding the distribution ranges of species in this family, as well as adding about 22 potentially new species and seven genera which have not yet been described (Pereira da Conceicoa 2016). This study included work done on upper reaches of rivers within the Langeberg Complex (for e.g. the Huis River, Boosmansbos Wilderness Area).

2.4.2 Amphibians

There are at least 24 amphibians known from the Langeberg Complex. All except one species are listed as least Concern. The one exception is the Cape rain frog (*Breviceps gibbosus*) which is listed as Near Threatened. In the Complex area this species which is known from a single record in Montagu. It is possible that this record represents an introduction and its presence as a self-sustaining population in this area still needs to be assessed.

Two species are endemic to the Langeberg Mountain Range include: the Tradouw mountain toadlet (*Capensibufo tradouwi)* and the eastern ghost frog (*Heleophryne orientalis*). Both species occur well up the mountains. Ghost frogs (*Heleophryne*) require perennial, clean flowing water and thus good control of invasive alien plants will help ensure persistence and be an indicator of good stream health. It appears mountain toadlets (*Capensibufo*) generally require fynbos with a regular fire cycle and shallow seeps for breeding. Again here the primary management action required is control of invasive alien plants.

Most frog species can be conserved in the Langeberg Complex by ensuring that the vegetation and surface water is well managed. This requires that the area burnt, veld age and fire return frequency are within the acceptable bounds as determined by the thresholds set for the vegetation types in the Complex. It also requires sustainable water management which includes maintaining rivers in their set management categories and protecting water source areas e.g. seeps from invasive alien plant species.

2.4.3 Fish

2.4.3.1 Freshwater fish

The Langeberg Complex is located within the Cape Fold Ecoregion (CFE), one of the six aquatic ecoregions of Southern Africa (Abell *et al.* 2008). Geographically, the CFE is very similar in extent to the better-known Cape Floristic Region. Catchment and river systems of the CFE is characterised by relatively low freshwater fish diversity, but with high levels of endemism. The Blombos catchment surrounding the Geelkrans Nature Reserve has no perennial rivers and therefore is not considered important from a freshwater fish perspective. The remaining four systems (Breede, Duiwenhoks, Goukou and Gouritz) is home to eleven currently described indigenous freshwater fish species from four families. These include five smaller minnow species of the genera *Enteromius* and *Pseudobarbus*, one species each of the genera *Galaxias* and *Sandelia*, two larger cyprinids of the genera *Labeo* and *Cheilobarbus* and two freshwater eel species of the genus *Anguilla* (Skelton 2001). Local taxonomic research has indicated that many of the currently described indigenous fish species of the CFE consist of a number of genetically unique lineages. In a recent review by Ellender *et al.* (2017), the current taxonomic richness of the CFE is reported to be 42 unique taxa (described species and know unique lineages). The majority of these lineages await taxonomic description as new species and should in the meantime be managed and conserved as unique taxa (Swartz 2005; Skelton & Swartz 2011; Chakona *et al*. 2013). Many new taxa have very limited distribution ranges and as a result are highly threatened (Tweddle *et al.* 2009; Chakona *et al*. 2013). The conservation status of South African freshwater fish was assessed in 2016 and many freshwater fishes of the CFE are listed as Threatened (Table 2.4).

The Breede, Duiwenhoks and Goukou systems have relatively similar fish faunas. Historically these systems were home to three native species, namely the Breede river redfin *Pseudobarbus burchelli (*Smith 1841), the *Cape galaxias zebratus* (Castelnau 1861) and the Cape kurper *Sandelia capensis* (Cuvier 1831). In addition, the Berg-Breede whitefish *C. capensis* is present in the Breede River system but absent from the Duiwenhoks and Goukou systems. Recent research has presented evidence that the former three species each represent a species complex. Swartz *et al*. (2009) presented the first evidence that the currently described *Pseudobarbus burchelli,* which occur in the Breede and associated river systems in the Western Cape Province, is a species complex consisting of four genetically distinct lineages. These are a widespread lineage in the Breede, Duiwenhoks and Goukou River systems (*Pseudobarbus* sp. "*burchelli* Breede"), a lineage in the Heuningnes River system on the Agulhas Plain (*Pseudobarbus* sp. "*burchelli* Heuningnes") and a lineage restricted to the Tradouw catchment in the lower section of the Breede River system (*Pseudobarbus* sp. "*burchelli* Tradouw"). The latter lineage has provisionally been designated as *Pseudobarbus burchelli* sensu stricto as type material for the species was collected form the Tradouw catchment. The fourth lineage has been described as the Giant redfin *Pseudobarbus skeltoni*, (Chakona *et al.* 2013), currently known to be restricted to three localities in the upper Riviersonderend (Kadye *et al.* 2016).

Several unique lineages within both *G. zebratus* and *S. capensis* also exist (Chakona *et al*. 2013). Of these, at least four lineages of galaxias are present in the Breede system (Table 2.4). A unique and range restricted galaxias, *Galaxias sp. '*zebratus Goukou' is endemic to the Goukou system. There is ongoing research to resolve the

taxonomy of *S. capensis*, but Chakona *et al*. (2013) presented evidence for a lineage within the complex that is restricted to the Breede, Duiwenhoks and Goukou systems. *Cheilobarbus caoensis* was historically widespread in both the Berg and Breede systems, but now persists mainly as large populations in Brandvlei/Kwaggaskloof and Sanddrif Dams, and some remnant riverine populations in the Breede mainstream. The conservation status of South African freshwater fish was assessed in 2016 and many freshwater fishes associated with the Langeberg Complex are listed as Threatened (Table 2.4). In terms of conservation status, the only Critically Rare fish relevant to the Complex is the Barrydale redfin *Pseudobarbus burchelli sensu stricto* (Figure 2.12). It is range restricted to the Tradouw catchment and a BMP-S is being developed for this species that is aimed at implementing conservation actions to ensure its long-term survival in the wild.

Figure 2.12: The Critically Endangered Barrydale redfin *Pseudobarbus burchelli sensu stricto*. Photo: Riaan van der Walt.

A number of alien and invasive fish species are present in the greater Gouritz, Breede, Duiwenhoks and Goukou systems. These include species both from outside the country as well as species native to the country, but alien to the CFE. Invasive species from outside South Africa include two salmonids (rainbow trout *Oncorhynchus mykiss* and brown trout *Salmo trutta*), four centrarchids (black bass species, namely largemouth bass *Micropterus salmoides*, smallmouth bass *M. dolomieu* and spotted bass *M. punctulatus,* as well as bluegill sunfish *Lepomis macrochirus*) and a single cyprinid the common carp *Cyprinus carpio*. Mozambique tilapia *Oreochromis*

mossambicus, sharptooth catfish *Clarias gariepinus*, banded tilapia *sparrmanii* and the Orange-Vaal smallmouth yellowfish *Labeobarbus aeneus* are all native to South Africa, however they are alien and invasive in the rivers of the Cape Fold Ecoregion (Skelton 2001). Alien and invasive species are widespread throughout both the Breede and Gouritz system but the extent of their invasion into the Goukou and Duiwenhoks systems are not as well researched. Where they have invaded, rainbow and brown trout favour cooler mountain streams, with black bass, tilapia and common carp being more common in the warmer lower altitude sections of rivers. Sharptooth catfish is also a typical lowland species but is able to invade headwater streams in its extralimital range in the Eastern Cape (Ellender *et al.* 2015).

Table 2.4: Conservation status, main threats and distribution of freshwater fish of the Breede, Duiwenhoks, Goukou and Gouritz River systems within the Cape Fold Ecoregion. Data from Skelton 2001 and Ellender *et al.* 2017.

Species	IUCN status	Reference	Main threat	Distribution
Family Anguillidae				
Giant mottled eel *Anguilla marmorata*	LC	Jacoby and Gollock 2014a	0	Madagascar, South East Africa to Eastern Cape
Longfin eel *Anguilla mossambica* #	LC	Jacoby and Gollock 2014b	0	Kenya to Cape Agulhas, also Madagascar
Family Cyprinidae				
Berg-Breede River whitefish *Cheilobarbus capensis*	EN	Impson *et al.* 2017	1,2,4,5	Berg and Breede River systems
Barrydale redfin *Pseudobarbus burchelli* sensu stricto #	CR	Jordaan & Chakona 2017	1,2,3	Tradouw River catchment
Breede River redfin *Pseudobarbus* sp. 'burchelli Breede' #	VU	Jordaan & Chakona 2017	1,2	Tributaries of Breede, Duiwenhoks and Goukou
Chubbyhead barb *Enteromius anoplus*	LC	Woodford 2017	0	Widespread throughout South Africa
Giant redfin *Pseudobarbus skeltoni*	EN	Chakona *et al.* 2017	1	Three localities in the upper Riviersonderend
Heuningnes redfin *Pseudobarbus* sp. '*burchelli* Heuningnes'	CR	Chakona & Jordaan, 2017*	1,2	Heuningnes River system
Keurbooms redfin *Pseudobarbus* sp. '*tenuis* Keurbooms'	EN	Jordaan & Chakona 2017*	1,2	Keurbooms River system
Moggel *Labeo umbratus*	LC	Impson *et al.* 2017	0	Gouritz to Bushmans systems, also Orange-Vaal
Slender redfin *Pseudobarbus tenuis*	NT	Jordaan & Chakona 2018	1,2	Gouritz River system
Smallscale redfin *Pseudobarbus asper* #	VU	Jordaan & Chakona 2018	1,2	Gouritz and Gamtoos systems
Family Galaxiidae				
Cape galaxias *zebratus* #	DD	Swartz *et al*. 2007	1,2,5	Type locality uncertain and required revision
Galaxias sp. '*zebratus* Breede'	EN	Chakona & Jordaan 2017*	1,2	Hex and Bothaspruit Rivers, mainstream Breede
Galaxias sp. '*zebratus nebula'* #	NE	-	-	Widespread across CFR from Olifants to Bietou
Galaxias sp. '*zebratus* rectognatus'	NE	-	-	Riviersonderend sub-catchment of Breede system
Galaxias sp. '*zebratus* Riviersonderend'#	VU	Chakona 2017	1,2	Tributaries of Riviersonderend, also in Breede
Galaxias sp. '*zebratus* Goukou' #	VU	Chakona 2017	1	Goukou River system
Family Anabantidae				
Cape kurper *Sandelia capensis* #	DD	Chakona 2018	1,2,5	Type locality uncertain and required revision
Sandelia sp. '*capensis* Breede' #	NE	-	-	Tributaries of Breede, Duiwenhoks and Goukou systems

Key: EN = Endangered, NT = Near Threatened, LC = Least Concern, DD = Data Deficient. Main threats (0 = no dominant threat identified, 1 = alien fish, 2 = habitat destruction, 3 = pollution, 4 = utilization, 5 = genetic integrity) in the CFR, South Africa (after Skelton 2001; Tweddle *et al.* 2009). *Assessments published on the SANBI website only. *Species designated with a # indicated those with an expected or confirmed presence in the rivers of the Langeberg Complex.

2.4.3.2 Estuarine fish

A total of 78 fish species from 40 families have been recorded in the Goukou Estuary (CSIR 2011; DWS 2015). Fish categorisation in estuaries are broken up into 5 categories based on their dependence on estuaries for breeding and survival (Whitfield 1994).

In the reserve determination study (DWS 2015), estuarine breeders (Category Ia), which spend their entire life-cycle in estuaries, made 57.1 % of the total catch sample. The estuarine round-herring (*Gilchristella aestuaria*) made 57 % of the total sample which made it the overwhelmingly most abundant species. Species that have marine and estuarine breeding populations (Category Ib) comprised of seven species which included *Atherina breviceps, Caffrogobius nudiceps, C. gilchristi, Psammogobius knysnaensis* and *Syngnathus temmincikii*. These species made up 11.8 % of the total catch sample (DWS 2015).

Species that fall within Category II are euryhaline in nature and usually breed at sea with the juveniles showing various degrees of dependence on estuaries. These species are regularly sampled in the marine and estuarine environment. Conservation dependent partially estuarine-dependent species (Category IIa) found in the Goukou Estuary include leervis (*Lichia amia*), spotted grunter (*Pomodasys commersonnii*), oval moony (*Monodactylus falciformis*), dusky kob (*Argyrosomus japonicus*) and white steenbras (*Lithognathus lithognathus*) (DWS 2015). In the CSIR (2011) study, this group comprised a total of 11.1% of the total sample size. Freshwater mullet (*Myxus capensis*) and flathead mullet *(Mugil cephalus*) fall into Category IIa as well but venture far into freshwater and may therefore also be categorised as facultative catadromous (Vb) species. Partially estuarine-dependent (Category IIb) species whose juveniles are usually more abundant in estuaries are represented by white sea-catfish (*Galeichthys feliceps*), groovy mullet (*Liza dumerilii*), striped mullet (*L. tricuspidens*), Cape sole (*Heteromycteris capensis*) and blackhand sole (*Solea bleekeri*). Category IIc species whose juveniles tend to be more abundant in the surf-zone, are represented by the southern mullet (*L. richardsonii*), elf (*Pomatomus saltatrix*) and blacktail (*Diplodus sargus*). This was reflected in CSIR (2011), where the total sample size with Category IIb comprising 16.1 % and IIc 3.3 % of the total sample size. Of these, *L. richardsonii* is the most versatile and opportunistic, able to take advantage of prime conditions in the estuarine and marine environment.

Thirty-one estuarine independent marine species (Category III) have been recorded in the Goukou Estuary. The proportion of marine species (40%) is high compared to other permanently open systems in the region and may be partly due to the greater marine influence in the present day (a reduction in freshwater flow). It is also a reflection of a seasonal pulse of tropical species in the summer months which find temporary refuge from cold upwelled water in the adjacent marine environment. Their abundance in the estuary at present is low, with only 0.3 % of the total sample size. Longfin eel *(Anguilla mossambica*) is the only catadromous (Category V) species reported from the system.

2.4.3.3 Marine fish

A total of 62 species of bony fish and 19 species of sharks and rays have been reported in the Stilbaai MPA (CapeNature 2018). Of the species recorded, there are two species listed as Critically Endangered; dageraad *Chrysoblephus cristiceps* and

the ragged-tooth shark *Carcharias taurus*. The red stumpnose *Chrysoblephus gibbiceps*, white steenbras *Lithognathus lithognathus*, and red steenbras *Petrus rupestris*, are listed as Endangered. Eleven species are listed as Vulnerable which includes six shark species. There are eight near threatened species and 19 species that are either classified as Data Deficient or Not Assessed.

There are 41 species of sparids that occur in the southern African region, 23 of those species have been sampled in Stilbaai MPA. Ten of the species in the MPA have an IUCN status of near threatened or worse. *Chrysoblephus laticeps* is classified as Near Threatened and their complex life-history makes them susceptible to over-harvesting. The species is classified as over-exploited but since the state of emergency declared in 2000, the population has shown signs of recovery. There appears to be a healthy population of *C. laticeps* that reside in the Stilbaai MPA. *Chrysoblephus laticeps* was the second most abundant species recorded in Baited Remote Underwater Video Analysis (BRUV) sampling between 2010 and 2015 (De Vos 2012; CapeNature 2018). *Petrus rupestris* has been sampled in Stilbaai MPA but numbers are relatively low and sightings sporadic (De Vos 2012; CapeNature 2018).

The sparid species of highest concern is the endemic *C. cristiceps*, with the population being over exploited and still decreasing. In 2014, dageraad were found on the high profile reefs within the Stilbaai MPA which makes the MPA an important protective area for dageraad and all sparid species.

There are seven species of sharks and rays that are limited to a southern African distribution range. The puffadder shyshark *Haploblepharus edwardsii*, dark shyshark *H. pictus*, leopard catshark *Poroderma pantherinum*, pyjama shark *P. africanum*, spotted gullyshark *Triakis megalopterus* and the diamond butterfly ray *Gymnura natalensis* are endemic to Southern Africa. All of these species are regularly recorded in Stilbaai MPA. Other species of shark that have been recorded in the Stilbaai MPA have global distribution ranges and while they occur in the Stilbaai MPA, they do not appear to spend long periods of time within the Stilbaai MPA.

In recent years, there have been reports of Indo-Pacific species (12 species to date) in the Stilbaai MPA and Goukou Estuary. These species include four species of butterflyfish *Chaetodon* spp., two sergeants *Abudeduf* spp., an ambon pufferfish *Canthigaster amboinensis*, two surgeonfish *Acanthurus* spp., a coralfish *Heniochus acuminatus*, a flagtail *Kuhlia mugil* and a tiger snake-eel *Myrichthys maculosus*. These fish are outside of their natural distribution range and their occurrence in this area can likely be attributed to these fish being caught up in the Agulhas Current which carries them from the natural ranges to the Agulhas Bank. These species don't appear to be establishing a breeding population and there is a strong possibility that they cannot tolerate periods of low ocean temperatures and die off.

2.4.4 Reptiles

The Langeberg Complex has a very good diversity of reptile species with at least 58 species recorded. The taxonomic status of an isolated population of chameleons in the Grootvadersbosch forest is uncertain. Although this chameleon is morphologically similar to Knysna dwarf chameleon (*Bradypodion damaranum*) (Figure 2.13), preliminary data suggests that it is genetically distinct. However, this analysis is based on a single sample and more data are needed to determine the status of the Grootvadersbosch population (Tolley 2014a). It is a forest specialist and is a narrow

endemic, found only in Grootvadersbosch Nature Reserve. Little karoo dwarf chameleon (*Bradypodion gutturale*) is the other chameleon inhabitant of the Langeberg and surrounds – preferring dry fynbos, renosterveld and karroid vegetation (Global IUCN Red List status: Least Concern) (Tolley 2014b).

The good reptile diversity is largely due to the extensive area and many varied habitats covered by the Langeberg Complex. The list of reptiles known to occur in the Complex is quite comprehensive for the area as a whole but can be improved for many of the constituent protected areas (e.g. Witbosrivier, Warmwaterberg, Twistniet and Blomboschfontein). There are a few terrestrial species that are expected to occur within the Complex that have not yet been recorded. However, these are listed as Least Concern and are therefore not priority species for management as yet.

Figure 2.13: The Grootvadersbosch dwarf chameleon. Photo: Keir and Alouise Lynch, Bionerds PTY Ltd.

Good management of the veld: area burnt, veld age and fire return frequency are within the acceptable bounds should ensure persistence of the reptile diversity of this area.

For the marine reptiles that occur off the southern coast of the Langeberg Complex there is one threatened species recorded, the loggerhead turtle (*Caretta caretta*), listed as Vulnerable, although it is expected that leatherback turtles (*Dermochelys coriacea*), hawksbill turtles (*Eretmochelys imbricata*) and green sea turtles (*Chelonia mydas*) which are regionally listed as Endangered, Critically Endangered and Near Threatened respectively are also likely to utilize the marine environment in this area. This utilisation is transient in nature and these species are not resident in the Stilbaai

MPA. Management of these species will be primarily based on conservation of the living marine resources in the Stilbaai MPA. Records of strandings should always be recorded and if the animals are still alive an effort should be made to return the animals to the sea if and when they are healthy enough for release.

2.4.5 Avifauna

A number of bird habitats are present in the Langeberg Complex. In terms of size the largest is the mountain fynbos habitat which can be found on those portions of the Complex situated along the Langeberg Mountain Range. The Karroid vegetation occurring predominantly within the Thornhill (Doornkloof) property is the second largest habitat type but is substantially smaller than the previous habitat type. The Grootvadersbosch Nature Reserve also contains small patches of Afromontane forests. Along the coast there are properties east and west of the Goukou River mouth which are predominantly covered with coastal vegetation, while the Stilbaai MPA provides near-shore, coastal, estuarine and riverine habitat. The latter as the Stilbaai MPA boundary extends 16 km upstream of the mouth. Additional riverine habitat can be found alongside the various rivers flowing through the properties as well as the majority of the Kruisriver property situated on the upper reaches of the Goukou River. The number and type of bird species (225 species) recorded within the Complex reflects this wide range of habitats.

The large area of mountain fynbos habitat provides extensive habitat for the seven species of birds' endemic to the Fynbos biome. The habitat preference of these endemic species vary indicating the importance of maintaining a mosaic of different vegetation age and types within the Langeberg Complex. Cape Sugarbird *Promerops cafer* (Figure 2.14) and Orange-breasted Sunbird *Anthobaphes violacea* prefer mature mountain Fynbos (Siegfried & Crowe 1983), while Hottentot Buttonquail *Turnix hottentotus* (Figure 2.15) generally occur in young fynbos between the veld age of two and five years, with very little preference for recently burnt and senescent fynbos (Lee *et al.* 2017). Cape Siskin *Crithagra totta* is associated with restio-dominated fynbos (Fraser 1997a), and the Cape Rock-jumper *Chaetops frenatus* occur in high mountain areas with open rocky habitats (Cohen & Frauenknecht 2005) Victorin's Scrub-warbler *Cryptillas victorini* is found predominantly in mesic mountain fynbos (Fraser 1997b), while the Protea Canary *Crithagra leucopterus* prefers open arid Fynbos with tall Protea plants (Milewski 1976).

Evidence has indicated that climate change has or will have an impact on at least three of the endemic species, namely the Cape Rock-jumper, Protea Seedeater and Victorin's Warbler (Lee & Barnard 2015). The reporting rates within the Langeberg Complex for the latter species suggests that the population is relatively healthy, while the reporting rates of the Cape Rock-jumper and Protea Seedeater is relatively low (http://sabap2.adu.org.za/).

Figure 2.14: Cape Sugarbird (*Promerops cafer*) in mature fynbos. Photo: Rhett Smart.

Reporting rates for the other endemics with the exception of the Hottentot Buttonquail indicate that these populations are relatively healthy. Within the Langeberg Complex Hottentot Buttonquail has only been recorded from the Boosmansbos Wilderness Area (Lee *et al.* 2018). This is a cryptic and very difficult to observe species, hence the low recording rates. It is therefore possible that they occur in higher numbers in suitable habitat as intimated by Ryan and Hockey (1995). The species is however listed as Endangered both at a regional and global scale, because of low population numbers and fragmented distribution (Peacock 2015), although Lee *et al.* (2018) recommends that it be listed as Vulnerable. Despite the relatively healthy populations of endemics within the Complex, Lee *et al.* (2015), looking at the difference in reporting rates between the first and second South African Bird Atlas projects, has detected a decline in six species. The Hottentot Buttonquail was excluded from the Lee *et al.* (2015) analysis due to taxonomic changes between the two projects.

Some of the species recorded within the Langeberg Complex on a regular basis are more common in the habitats (mostly agricultural) adjacent to the Complex (e.g. Denham's Bustard *Neotis denhami*, Blue Crane *Anthropoides paradisea*) or occur at relatively low numbers (e.g. Lanner Falcon *Falco biarmicus*, Martial Eagle *Polemaetus bellicosus* and Curlew Sandpiper *Calidris ferruginea*). As these species utilise the Complex sporadically management strategies implemented to improve avifaunal habitat or mitigate threats will not have a significant impact on the species as a whole.

Figure 2.15: Hottentot Buttonquail (*Turnix hottentotus*). Photo: Kevin Shaw.

The threatened species that are not endemic to the Fynbos but are sighted fairly regularly within the Langeberg Complex are the Black Harrier *Circus maurus*, Cape Cormorant *Phalacrocorax capensis*, African Marsh-harrier *Circus ranivorus*, Cape Gannet *Morus capensis*, Knysna Warbler *Bradypterus sylvaticus*, Caspian Tern *Sterna caspia* and Verreaux's Eagle *Aquila verreauxii*. The three marine species while occurring in the reserve are threatened by threats outside the control of the reserve manager and these threats are being dealt with at a national level. The African Marsh-harrier occurs almost exclusively on wetlands, but do forage in neighbouring habitats like Fynbos, Renosterveld and Agricultural lands (Simmons 2005). Observations of this species within the general area of the reserve are sporadic with low reporting rates recorded for those portions of the Complex where the species was observed. The Kruis River portion of the Complex would be one of the few suitable areas where the species would occur regularly and efforts to rehabilitate, maintain and conserve the wetland habitat would benefit the species. The Black Harrier were found in numerous portions comprising the Complex, with lower reporting rates for the Thornhill (Doornkloof) property and those properties in the Langeberg mountains, but higher reporting rates for the coastal portions.

The Langeberg Complex sits on the edge of the western distribution range of the Knysna Warbler, if the two isolated populations in the Riviersonderend and Cape Town areas are excluded. The species has been recorded from a few of the portions that make up the Complex, and at relatively high reporting rates indicating healthy populations. This is important as Smith (2005) indicate that the distribution is patchy and that the species is rare. Conservation of riverine vegetation and forest edge habitat is crucial for this species. The Verreaux's Eagles is restricted to the mountainous

habitat within the Complex which is extensive. Despite this, reporting rates for the species within the reserve is relatively low, which corresponds to the low density area mapped for the species in the latest red data book for birds (Taylor 2015).

Historically the Crowned Eagle (*Stephanoaetus coronatus*) bred on Grootvadersbosch Nature Reserve. This species is listed as Near Threatened according to the IUCN (Birdlife International 2018) and this reserve falls within its westernmost locality in Southern Africa.

Mitigation of threats to the habitats of especially threatened and endemic bird species will improve the populations of individual species within the Langeberg Complex and contribute to the improvement of the species concerned. Climate change and its impacts on certain avifaunal species is a concern and unfortunately can only be addressed at a national and international level.

2.4.6 Mammals

A total of 97 terrestrial mammal species have been recorded for the Langeberg Complex based on historical and current accounts. Several species of bats, small rodents and insectivores have been recorded in the Complex, including some of the smallest mammals such as the pygmy mouse (*Mus minutoides*). Several priority small mammals have been identified that needs actions based on their endemicity or conservation status (Birss 2017). The Boosmansbos long-tailed forest shrew *(Myosorex longicaudatus boosmani)* is classified as Critically Endangered and is only known from one locality in the Boosmansbos Wilderness Area from the late 1990s. Field surveys are necessary to determine the area of occupancy of this species. The white-tailed mouse (*Mystromys albicaudatus*) has a widespread but patchy and fragmented distribution across South Africa and has a conservation status of Vulnerable. It appears to have a preference for microhabitats within vegetation types and transitory habitats post fires and have been identified as a prey species for owls (Pillay *et al.* 2016). They are very rare and have very low trapping records. Further field surveys are needed to estimate population size and trends more accurately (Avenant *et al.* 2016). The laminate vlei rat (*Otomys laminatus*) is classified as Near Threatened and suspected to occur in the Boosmansbos Wilderness Area. In addition, distribution data must be collected to determine area of occupancy for the Cape marsh rat (*Dasymys capensis*) (Vulnerable), spectacled dormouse (*Graphiurus ocularis*) (Near Threatened) and long-tailed forest shrew (*Myosorex longicaudatus*) (Endangered). The Cape marsh rat (*Dasymys capensis*), also referred to as the African marsh rat, is listed regionally as Vulnerable and is endemic to the Western Cape Province. The Cape marsh rat has been recorded in very few localities in the Western Cape occurring from Wolsley to Knysna. In the Langeberg Complex they have been listed as one of several potential prey items for the Cape leopard (*Panthera pardus*). Cape marsh rats are dependent on intact rivers and wetland ecosystems. Their current population trend is declining due to habitat loss and degradation. According to Pillay *et al.* (2016) the Cape marsh rat has the potential to become the flagship wetland species for biodiversity stewardship schemes as they are indicative of healthy and intact wetland systems. Distribution data for this species must be prioritized.

Several eco-typical game species, such as Cape grysbok (*Raphicerus melanotis)*, klipspringer (*Oreotragus oreotragus)*, steenbok (*Raphicerus* campestris) (Figure 2.16), bushbuck (*Tragelaphus sylvaticus*), common duiker (*Sylvicapra grimmia grimmia*) and grey rhebok (*Pelea capreolus*) occurs naturally in the landscape and generally exhibit unimpeded dispersal. They are important indicators of the overall ecological state of the Langeberg Complex. Their persistence is indicative of resilience against urban edge effects, however, the impact of poaching is currently being investigated. Presence and persistence of these species is inferred through monitoring and recording spatial distribution data and natality observations.

Figure 2.16: Steenbok (*Raphicerus campestris*). Photo: Ian Allen.

Grey rhebok, a South African endemic species, have demonstrated an overall national population decline and are now IUCN Red Listed as Near Threatened. The maintenance of population trend data for this species is focussed on seasonal observations towards spatial population density indications in the absence of conducting precision counts. The current estimates inform a baseline against which future data will be compared to establish whether the population is stable, declining or increasing. Similarly, Cape grysbok, a near endemic to the CFR, is primarily associated with the Fynbos biome and also primarily regarded as a browser (Palmer *et al.* 2016). Cape grysbok are poached for bushmeat and are vulnerable to snaring. Klipspringer are associated with steep rocky and mountainous habitats and are able to move efficiently over rocky terrain due to its small body size and the structure of their feet. Klipspringer coats provide excellent insulation against extremes in

temperature and they are able to live at high and low elevations with a very adaptable diet, consisting primarily of browse in the Langeberg Complex.

Various predators including the Cape leopard (*Panthera pardus*), African wild cat (*Felis silvestris*), caracal (*Caracal caracal*), African clawless otter (*Aonyx capensis*) and black-backed jackal (*Canis mesomelas*) are also present throughout the Langeberg Complex landscape. Cape leopard (*Panthera pardus pardus*) is listed as Vulnerable regionally and Near Threatened globally (Swanepoel *et al.* 2016). The African clawless otter (*Aonyx capensis*) and the brown hyena (*Parahyaena brunnea*) are of conservation concern in that they are indicative of ecosystem functioning outside of formally protected areas. Both species were widely distributed throughout the Western Cape Province. Cape clawless otters exhibit a reduction in abundance associated with riparian habitat transformation, pollution and disturbance (Okes *et al*. 2016).

The 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. The African striped weasel can only persist in habitats with adequate prey since it has a very high metabolic rate. African weasel numbers are reported to have declined in the rest of South Africa but presence data indicate an increase in numbers in the Western Cape Province, despite inconsistent reporting frequencies. Further studies and field surveys to determine the current area of occupancy, densities and home range sizes are recommended (Child *et al.* 2016).

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.

Thirty-seven marine mammals have been recorded in the Stilbaai MPA. Three of these were identified as priority species for conservation action (Birss 2017) and include the Critically Endangered Antarctic true blue whale (*Baleaenoptera musculus intermedia*), and the Vulnerable sperm whale (*Physeter macrocephalus*) and Bryde's whale (*Balaenoptera edeni*). Blue Whales are highly migratory and wide-ranging with no barriers to dispersal. The population is currently increasing but at a slow rate relative to other whales that have become protected in the same period. Continued monitoring of population recovery and mitigation of potential noise pollution are recommended (Findlay & Child 2016). The sperm whale population is considered to be recovering although the commercial whaling industry reduced the global abundance significantly and may have resulted in a skewed sex ratio in the region. Sperm whales are highly migratory and wide-ranging with no barriers to dispersal. Abundance and population trend data for this species is required (Elwen *et al.* 2016). The population of Bryde's whales is estimated at less than 1 000 mature individuals and is not considered to be migratory with no apparent barriers to dispersal. For this species taxonomic resolution and current estimates of population size and trends are required (Penry *et al.* 2016).

2.5 Heritage Context

Section 5 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) outlines general principles for heritage resources management while Section 9 of this Act outlines responsibilities of the State and supported bodies.

2.5.1 Heritage resources

The Geelkrans Nature Reserve Cluster contains the Noordkapperpunt fish traps (vis vywers) outside Still Bay, which is in process of being declared a National Heritage Site. These structures fall under the classification as a maritime archaeological site. The Stilbaai Fish traps does contain elements of Living Heritage such as cultural tradition, skills and techniques and indigenous knowledge systems.

The Noordkapperpunt fish traps are the best-preserved example of an aspect of the technological and economic evolution of fishing practices in South Africa and thus represent the cultural, social and historic values that fish traps as a collective hold for the country (Figure 2.17). These fish traps are arguably the best-preserved and largest cluster of stone-walled fish traps on the South African coast (Hine 2010). As such, they have both scientific and research value. Although their age remains a debate, it is possible that these sites are pre-colonial in origin, potentially making them an example of South Africa's oldest and most enduring maritime and underwater cultural heritage. It is thought that the traps were constructed after the 1920s by local farmers (Hine 2008, 2010) and aerial photographs show that new traps were built between 1938 and 2006 (Kemp 2006). Whatever their age, the Noordkapperpunt fish traps highlight the significance of economic and technological innovation in the history of South Africa's coastal communities. They are of outstanding national significance as an example of intangible/living heritage, and for their demonstration of the interrelatedness of cultural heritage and the natural environment.

There are 25 fish traps at Noordkapperpunt that were, until relatively recently, maintained by local fishers/owners. The traps are situated in the intertidal zone and consist of circular enclosures made of local rock and stone. The traps are designed to operate most effectively on the spring tide, with fish entering them over the walls on the spring high tide. As the tide retreats the fish are trapped within the traps, making them easy to catch with nets or spears (Hine 2010). These fish traps have been used and maintained by local fishermen and farmers since at least the early 20th century and are still usable today.

Figure 2.17: Fish traps at Geelkrans. Photo: Jean du Plessis.

The Noordkapperpunt fish traps were declared as a National Monument in 1998 under the then National Monuments Act, 1969 (Act No. 28 of 1969 as amended). When the National Heritage Resources Act came into force they were, like all former National Monuments automatically assigned Grade II status – i.e. sites with qualities which make them significant within the context of a province or a region. The fish traps were nominated for consideration as a National Heritage site in 2003, but they were only assessed for Grade I status by the National Heritage Resources Act's Grading and Declaration Review Committee in 2015.

In 2005 the Department of Agriculture, Forestry and Fisheries (DAFF) announced its intention to declare the area in which the fish traps are situated a MPA under the Marine Living Resources Act, 1998 (Act No. 18 of 1998). The Stilbaai MPA was declared in 2008 and zoned as a restricted or core conservation area. This zoning banned the fishing of all species, as well as the use of nets to catch fish in the traps. The Stilbaai MPA, however, specifically included the fish traps as a cultural and historical asset with the aim of *"reduc[ing] the risks of habitat degradation and to preserve vywers, which have archaeological and cultural value"* (Du Toit & Attwood 2008).

The remainder of the heritage resources are comprised of shell middens found on all three coastal nature reserves of the Geelkrans Nature Reserve Cluster. Typically, these middens are found in close proximity to the coast from the northern side of primary dunes up to 150 m the high water mark. The Southern Cape coastal zone has been an attraction for human settlement since pre-colonial times. Research have shown that marine resources in the region was first used by settlements about 120 000 years ago and again during the last 12 000 years (Halkett & Mütti 2000). During these periods the region`s sea level and coastal position was about the same as it currently is. The first pre-colonial settlements were known as middens or shell middens, which were developed by Strandlopers. Middens can be identified as aggregations of food

refuse, hearths, structures, artefacts and burials of Strandloper settlements. Archaeologist discovered that middens from the last 2000 years contained clay ceramics and domestic animal skeletons. The most abundant skeletons were that of sheep, but cattle and goat bones were also discovered (Halkett and Mütti 2000). During Diaz`s voyage to Africa in 1488 he first reported seeing Khoekhoen herders with cattle on the region`s shores. Deacon (1982) suggests evidence of pre-colonial settlers is still visible along the shore of this region. For example, an abundance of shell midden and open air tool factory sites from the Early and Middle Stone Age (Figure 2.18) have been identified on the Kleinjongensfontein and Blomboschfontein Nature Reserves. These sites are recorded spatially and conserved *in situ*.

Figure 2.18: Eroded landscape where stone tools are found. Photo: Jean du Plessis.

It is estimated that there are in excess of 50 sites containing examples of rock art in the Langeberg Mountains. Thirty-two of the sites have been surveyed and documented to date.

The first European colonist moved to the region in about 1667 and by the mid-1800`s most of the pre-colonial settlers were displaced from the region. The colonist started using the land for agricultural practises, such as live-stock farming (Halkett & Mütti 2000).

The Garcia, Tradouw and Gysmanshoek Passes all have national significance. They were built by Thomas Baines. The bridle path, known locally as the Witblitzpad, is significant in that it was built during the Anglo-Boer War in 1900.

Mr. A H Garcia plotted a route along the Goukou River and by 1868 a bridal path route that had been constructed was regularly used by horsemen. In 1873 Thomas Bain was tasked with constructing a road along this route, which was completed in 1877.

The Garcia Pass Toll House was built at the northern end of Garcia Pass and operated until 1918, when Toll Gates were abolished. The Toll House was restored in 1986 and declared a National Monument. The road was tarred in 1963.

2.6 Socio-Economic Context

In terms of the Municipal Systems Act, 2000 (Act No. 32 of 2000), municipalities are required to use integrated development planning to plot future development in their mandated management areas. The municipal Integrated Development Plan (IDP) sets the strategic and budget priorities for development and aims to co-ordinate the work of local and other spheres of government. The IDP should also address how the environment will be managed and protected, and is supplemented by a Spatial Development Framework (SDF).

IDPs and SDFs are tools for integrating social, economic, and environmental issues. As biodiversity is a fundamental component of sustainable development, IDPs and SDFs offer an opportunity to ensure that biodiversity priorities are incorporated into municipal planning processes through consultation. In turn, the identification of biodiversity-related projects for the IDP can support local economic development and poverty alleviation. Municipalities within which the Langeberg Complex occurs is illustrated in Appendix 2 Map 1.

The primary landuse adjacent to the boundaries of the protected areas are mainly agriculture varying from livestock (sheep cattle and ostriches), dairy, fruit, grain and flower farming. Fishing is popular at Still Bay and the Goukou estuary is to a large extend used for recreational boating activities and fishing. A limited amount of subsistence fishing and farming is practised. The towns surrounding the Langeberg Complex are mostly dependent on agricultural related business apart from Still Bay that is a coastal town with a large number of holiday dwellings and retired people. Businesses are mainly service providers to the community.

Table 2.5 below provide information on population numbers, unemployment and poverty rates in the towns near the Langeberg Complex and based on information derived from the latest updated IDP's

Table 2.5: Socio-economic information for the Swellendam (2017), Hessequa (2019) and Langeberg Municipalities (2018).

Local municipality	No of residents	Households	Unemployment rate	Indigent households
Hessequa	55 559	17 731	9.5%	Not available
Langeberg	104 289	28 401	7.9%	7 265 (2016)
Swellendam	43 128	11 678	Not available	946 (2016)

It is clear that unemployment and poverty is a serious concern in the communities adjacent to the Langeberg Complex. The Complex therefore has to strive towards job creation in order to help mitigating the unemployment and poverty rates. This is

currently achieved within the Expanded Public Works Programmes (EPWP) (Natural Resource Management (NRM) programmes) and CapeNature Integrated Catchment Management (ICM). These programmes strive to employ a high number of un-skilled and semi-skilled youths (55%), women (55%) and disabled persons (2%). Local economic development is also promoted through the appointment and development of local services providers (Small, Medium and Micro Enterprises) in the conservation field e.g. fire suppression, maintaining firebreaks, roads, hiking trails and other infrastructure.

A further aim of the employment of un-skilled workers is to up-skill participants through specific training sessions in order for them to be able to be permanently employed within various economic sectors.

3 POLICY FRAMEWORK

CapeNature is subject to the framework of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996), national legislation including NEM: PAA, National World Heritage Convention Act, 1999 (Act No. 49 of 1999) and all associated regulations and norms and standards for the Management of Protected Areas in South Africa and all other relevant requirements as set out in the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and the National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008).

3.1 Purpose of Protected Area Management

The declaration of protected areas is part of a strategy to manage and conserve South Africa's biodiversity. Accordingly, the object of the management plan is to ensure the protection, conservation and management of the natural and cultural historic heritage in a manner that is consistent with the objectives of the NEM: PAA, and for the purpose for which protected areas were declared.

3.2 Guiding Principles

The following guiding principles underpin the management plan for the Langeberg Complex:

- Articulate desired results in terms of conservation outcomes, not actions.
- Articulate how management responses will lead to desired results.
- Monitor progress towards achieving desired results.
- Consider monitoring programme design at the onset of planning.
- Consider expected outcomes of management at the outset of planning.
- Invest in management response appropriate to the risk.
- Adapt strategies based on lessons learnt understanding that measuring effectiveness alone may not resolve uncertainty; data and analyses are necessary to guide management towards doing more of what works and less of what does not work.
- Share results to facilitate learning, acknowledging that although success is not a given, learning can be, through honest appraisal of efforts.

The Langeberg Complex is also subject to the principles and provisions of relevant international treaties and conventions, national and provincial legislation and policy, and any local contractual or co-management agreements.

3.3 Strategic Adaptive Management

Strategic Adaptive Management integrates planning, management and monitoring to provide a framework for:

- testing assumptions;
- learning through monitoring and evaluation; and
- adapting strategies or assumptions.

Strategic adaptive management bridges management and decision science by systematically evaluating results and using this information in a community of practice (CMP 2013) enabling management to change course when it becomes evident that it is necessary, rather than waiting until the end of a strategy to determine whether an intervention worked (CCNet 2012).

CapeNature has adopted, and applies, the Open Standards for the Practice of Conservation adaptive management framework (CMP 2013) as illustrated in Figure 3.1. The Open Standards facilitates strategic adaptive management through a systematic evidence based participatory process with stakeholders (CMP 2013). The systematic approach makes explicit the links between goals, focal values, threats, strategies and actions, enabling management to define and measure success of their actions in the Langeberg Complex over time.

The Open Standards framework is comprised of five stages (Figure 3.1):

- Conceptualising the protected area (i.e. defining the purpose of the protected area, establishing scope and vision; selecting focal values and assessing threats, and analysing the conservation situation (i.e. assessing contributing factors in terms of opportunities and challenges);
- Planning actions and monitoring (i.e. drafting the plan based on theories of change using results chains);
- Implementing actions and monitoring (i.e. drafting work plans, doing the work and monitoring the work);
- Analysing and using results to adapt (i.e. deciding if what was planned is working); and
- Capturing results, sharing and learning (i.e. learning and sharing what is learned).

The framework works on the rationale that effective conservation of carefully selected focal values will ensure the conservation of all indigenous biodiversity and cultural historic heritage within the Langeberg Complex that in turn contributes to a functional landscape. At the same time, the rationale follows that healthy focal values deliver ecosystem services essential for human wellbeing. An assessment of the current condition of focal values serves as a baseline against which to measure condition over the next 10 years and guides the formulation goals and conservation strategies with associated objectives, indicators and work plans.

As such, step 1 of the adaptive management framework illustrated in Figure 3.1 is foundational to effective management of the area.

Focal values are classified as follows:

- Natural values can be species, habitats or ecological systems, which collectively represent and encompass the biodiversity of the Langeberg Complex. They can include the physical, natural features from which ecosystem services flow, benefitting humans in a variety of ways.
- Cultural historic values are described in terms of the tangible features that collectively represent and encompass the cultural historic heritage of the Langeberg Complex. They can also include the physical, cultural and/or historic features from which human wellbeing values are derived.
- Human wellbeing values are the intangible or non-material values derived from tangible values, and which collectively represent the array of human wellbeing needs dependent on natural and cultural features; they can be defined in terms of the benefits delivered to humans by healthy ecosystems, or by intact cultural or historical features.

Figure 3.1: Strategic Adaptive Management Framework adapted from The Open Standards for the Practice of Conservation (CMP 2013).

3.4 Protected Area Management Effectiveness

Management effectiveness evaluation is the assessment of how well a protected area is being managed, primarily the extent to which management is protecting values and achieving objectives (Hockings *et al.* 2015). The following questions underpin management effectiveness evaluation (Leverington & Hockings 2004):

- Is the protected area effectively conserving the values for which it exists?
- Is management of the area effective and how can it be improved?
- Are specific projects, interventions and management activities achieving their objectives, and how can they be improved?

The monitoring and evaluation framework applied to the Langeberg Complex (illustrated in Figure 3.2 below) measures compliance and management effectiveness of the Complex in terms of the NEM: PAA and associated Norms and Standards for Protected Area Management. Management effectiveness is assessed over time using the Management Effectiveness Tracking Tool – South Africa (METT-SA) which is based on the six elements of good management:

- It begins with understanding the **context** of existing values and threats;
- progresses through **planning**;
- and allocation of resources (**inputs**);
- and as a result of management actions (**processes**);
- eventually produces products and services (**outputs**);
- that result in impacts or **outcomes**.

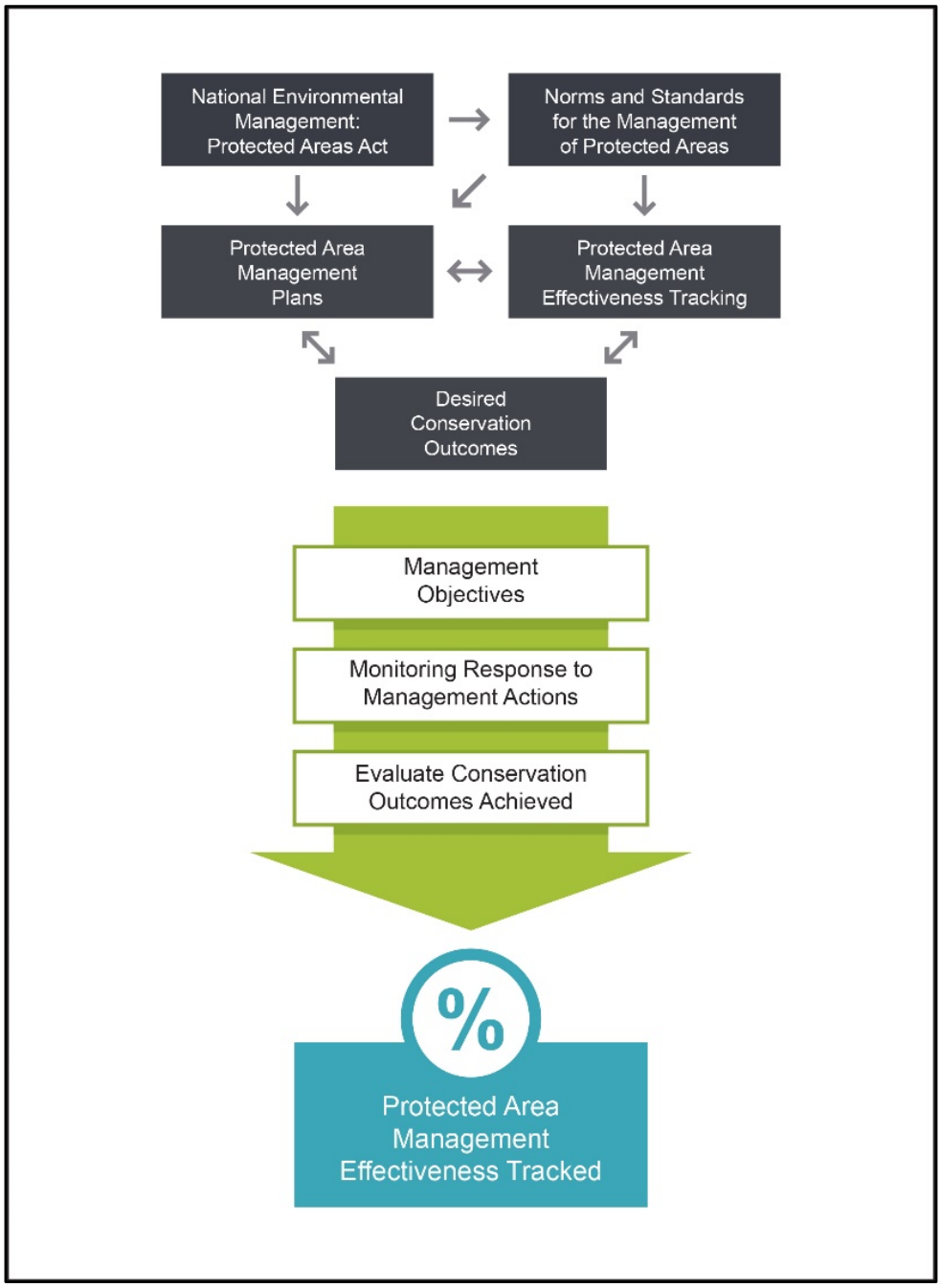

Figure 3.2: Protected Area Monitoring and Evaluation Framework.

Management effectiveness is measured at the strategic level as a percentage, drawing upon the results of fine scale monitoring linked to management actions, objectives, goals and focal values articulated in this plan, see Figure 3.2. Management effectiveness includes the measurement of administrative processes such as capacity and budgets that, when adequate, are likely to result in positive conservation outcomes.

Mechanisms for monitoring and evaluation are built into each aspect of the Strategic Plan (see Section 10) through the inclusion of verifiable indicators of progress. The protected area monitoring and evaluation programme, supplementary to the management plan, monitors site level implementation of the plan, status of values and

effectiveness of strategies. Results contribute to the Western Cape State of Biodiversity report, produced at five-year intervals.

Furthermore, management reports annually on implementation of the plan through CapeNature's strategic Performance Management System. The Performance Management System ensures that implementation of the management plan is embedded in individual staff performance agreements.

3.5 Policy Frameworks

Protected area management is guided by CapeNature policies, procedures and guidelines for use across all of its components. Policies, procedures and guidelines applicable to this management plan are referenced here and in Section 10 (Strategic Plan).

3.5.1 Internal rules

In terms of Section 52 of NEM: PAA, as amended, the management authority of a nature reserve may, in accordance with prescribed Norms and Standards, make rules for the proper administration of the area.

In addition to the Regulations for the Proper Administration of Nature Reserves, as gazetted on 12 February 2012 in Government Gazette 35021, and Regulations for the Proper Administration of Special Nature Reserves, National Parks and World Heritage Sites, as gazetted on 28 October 2005 in Government Gazette 28181, the Langeberg Complex implements the Nature Conservation Ordinance, 1974 (Ordinance No. 19 of 1974) and Provincial Notice 955 of 1975, as well as Regulations published under Government Notice 1111 in terms of the Marine Living Resources Act, 1998 (Act No. 18 of 1998).

In addition, the boating activities on the Goukou Estuary are managed according to Regulations published under Provincial Government Notice 7030 of 2012.

3.5.2 Financial

CapeNature is a schedule 3C public entity responsible for nature conservation in the Western Cape. CapeNature is the executive arm of the Western Cape Nature Conservation Board, established in terms of the Western Cape Nature Conservation Board Act, 1998 (Act No. 15 of 1998) as amended. The objectives of the Board as per the Board Act are:

- To promote and ensure nature conservation and deal pro-actively with related matters in the Province;
- To render services and provide facilities for research and training that would inform and contribute to nature conservation and related matters in the Province; and
- To generate income, within the framework of the applicable policy framework.

Funding for the entity comprises three main revenue streams. The majority of funding, which equates to approximately 80% of funding, is received in terms of a provincial allocation received in terms of Vote 9. Secondary funding, which is approximately the further 20%, is received from external donors and own revenue. Own revenue generation consists mainly of tourism income generated through activities and accommodation available on various nature reserves managed by the entity.

The entity prides itself on its strong internal controls, sound financial management and practicing of good corporate governance. Corporate governance within the entity embodies sound processes and systems and is guided by the Public Finance Management Act, 1999 (Act No. 1 of 1999) and the principles contained in the King 4 Report of Corporate Governance.

3.5.3 Safety and security

Business Continuity Plan: The CapeNature Business Continuity Plan establishes and provides emergency response procedures and protocols which need to be implemented should an event significantly disrupt the operations of the organisations or an emergency situation is declared by Management. The plan identifies critical services, how it will be maintained, how to minimise the impact, increase preparedness and initiate effective responses.

Integrated Compliance Plan: The Integrated Compliance Plan for the Langeberg Complex details how compliance and enforcement will be implemented in the Complex in order to:

- Prevent biodiversity loss caused by human activities on the Langeberg Complex through the implementation of active and passive compliance and enforcement operations.
- Ensure compliance with legislation through the monitoring of activities in the Langeberg Complex.
- Address and combat illegal activities through the institution of criminal proceedings.
- Reports illegal activities to the delegated authority where activities have a negative impact on the Langeberg Complex (e.g. listed activities in terms of NEMA).

It is a dynamic reference document which is continually updated and improved, using the data that is gathered in the course of the implementation thereof in order to achieve the management objectives of the Langeberg Complex.

Fire Protection Associations: CapeNature is obliged in terms of the National Veld and Forest Fire Act (Act No. 101 0f 1998) to be a member of the local Fire Protection Associations (FPA). Within the Western Cape, five large FPAs have been established that cover the whole area of the Province. The Nature Reserves in the Langeberg Complex are members of the Southern Cape-, Greater Overberg-, and Winelands FPAs. FPAs are the primary partnership tool in veldfire management in South Africa.

Fire Management Plan: The Fire Management Plan is essentially a derivative and part of the Protected Area Management Plan. The latter details the objectives of the Langeberg Complex. The Fire Management Plan uses this information to detail how fire will be managed to ensure that the ecological objectives of the Complex are met. This includes the management of both wild and controlled fires.

Fire response plan: The fire response plan forms part of the Fire Management Plan and serves as an operational document for cooperative wildfire management in the Langeberg Complex. This plan is compiled annually at regional level according to the CapeNature fire policy to ensure that there is complete co-operation at higher level. It

includes updated names and telephone numbers of all contact persons, radio frequencies and emergency notifications.

Regional oil spill contingency plan: Oil spills poses a significant threat to the Stilbaai MPA and Goukou Estuary. The possibility of an oil spill is perceived as a significant threat posed by shipping and the petroleum industry to marine and coastal systems. The probability of this occurring is considered low, although the environmental consequences of oil spills can be severe (Sink *et al.* 2012). Participation by protected area management in regional oil spill contingency planning and implementation is thus crucial. Coordinated rapid response is necessary and the development and implementation of integrated disaster management and contingency plans in the event of oil spills at sea is crucial.

3.5.4 Resource use

Resource utilisation is governed by CapeNature's Policy on consumptive use of wild flora from CapeNature-managed protected areas (2019). The policy implementation framework and protocol provides a guideline as to how access to the natural resources should be handled.

According to NEM: PAA, Section 50, the management authorities of protected areas, including World Heritage Sites may, subject to the management plan of the protected area or site, allow or enter into a written agreement with or authorise a local community inside or adjacent to the protected area or site, to allow members of the community to use in a sustainable manner biological resources in the protected area or site. Section 50, however also states that an activity allowed in terms of this section may not negatively affect the survival of any species in, or significantly disrupt the integrity of the ecological systems of the protected area or site.

CapeNature undertakes to build the capacity of Natural Resource Users and other relevant stakeholders on the sustainable utilisation of natural resources and its environmental regulatory framework in and outside protected areas.

3.5.5 Biodiversity management

Integrated Catchment Management Strategy: Integrated Catchment Management is regarded as improving and integrating the management of land, water and related natural biological resources in order to achieve the conservation, and sustainable and balanced use of these resources. The CapeNature Integrated Catchment Strategy will focus on three key areas; including Catchment, Freshwater and Coastal Management. All of these contribute to socio-economic development and are underpinned by key principles including knowledge, advocacy and awareness and an enabling environment.

The Integrated Catchment Management Strategy is aligned to national and provincial priorities and has five strategic objectives to guide implementation namely:

- To integrate the management of the physical, ecological and man-made components of the environment to ensure sustainability and integrity of the ecosystems and the services that they provide in order to ensure long-term climate change resilience.
- Management of biodiversity assets, ensuring their contribution to the economy, rural development, job creation and social wellbeing is enhanced.

- To enhance biodiversity implementation through the development of strategic tools and knowledge management systems.
- People are mobilised to adopt practices that sustain the long-term benefits of biodiversity.
- The required enabling environment (including institutional and professional capacity, policy and legal framework, partnerships, strategic and operational alignment and stakeholder support) is established and sustained.

Invasive Species Monitoring, Control and Eradication plans: Invasive Species Monitoring, Control and Eradication plans for the three Nature Reserve Clusters are compiled according to the requirements of the National Environmental Management: Biodiversity Act (NEM: BA), 2004 (Act No. 10 of 2004) Alien and Invasive Species Regulations and Lists (Oct 2014). The plans aim to guide management actions to reduce infestation densities and rates of fauna and flora species through systematic integrated control methods.

Integrated Compliance Plan: The Integrated Compliance Plan for the Langeberg Complex details how compliance and enforcement will be implemented in the Complex in order to achieve the management objectives of the Complex and to minimise biodiversity loss due to anthropogenic causes.

Western Cape Protected Area Expansion Strategy: This strategy aims to expand the Western Cape Protected Area network to encompass a more representative and resilient suite of areas that support biodiversity and ecological infrastructure, especially those threatened species and ecosystems that remain as yet unprotected. There are several properties adjacent to the various parcels of the Langeberg Complex that are listed as priority sites for protected area expansion.

Fencing and Enclosure of Game and Predators in the Western Cape Province Policy: All protected areas with game species are subject to the management guidelines outlined in the policy.

Game Translocation and Utilization Policy: All protected areas with game species are subject to the management guidelines outlined in the policy.

Stilbaai Marine Protected Area Management Plan: This management plan was developed in collaboration with DEA: Oceans and Coasts and it takes cognisance of the catchment to coast management plan for the Goukou River system.

Goukou River Estuarine Management Plan: The National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008, as amended by Act No. 36 of 2014), via the prescriptions of the South African National Estuarine Management Protocol, require Estuary Management Plans to be prepared for estuaries in order to create informed platforms for efficient and coordinated estuarine management. The Goukou Estuary Management Plan comprises two essential documents. The first document, the situation assessment report prepared by the CSIR (2011), provides an account of the current state of the system and related issues, and serves as the platform for the second document, the Goukou River Estuarine Management Plan (DEA&DP 2018).

Management of large game: All large game species in the Langeberg Complex and neighbouring properties will be dealt with according to the following principles:

- All game farms bordering the Langeberg Complex that have extra-limital or historic alien animals, must be enclosed to the standards as stipulated in the CapeNature fencing policy. Protected area personnel must do regular inspections on the reserve side of the fence and escapees must be reported to the owner immediately.
- If the owner is in possession of a Certificate of Adequate Enclosure, they must be given reasonable time to remove the animals as soon as possible. Game animals escaping from properties without a valid Certificate of Adequate Enclosure are *res nullius* and must be dealt with accordingly. Conservation Managers must stipulate and regulate the actions to remove the animals (*i.e.* flying with a helicopter to recapture or to chase back).
- In cases where *res nullius* game animals enter the Langeberg Complex, the Conservation Manager must report it immediately and a decision must be taken to either have the animals removed, culled or that they may remain on the protected area.
- All protected areas with game animals who wish to remove surplus animals, must follow protocol which includes approval at regional level (*i.e.* ecological meetings) and approval at corporate level.
- Where alien invasive game (*e.g.* fallow deer) are observed in protected areas, Conservation Managers must take immediate action by removing these animals in a humane manner.

Damage-causing wild animals: CapeNature aims to ensure coexistence of humans and indigenous wild animals and considers human-wildlife conflict as situations where artificially induced interactions between humans and wildlife lead to situations requiring mitigation of loss, disturbance or damage. CapeNature requires that human-wildlife conflict is managed, taking into consideration all legal, ethical and welfare implications and that interventions are carried out within an ecologically sound framework (CapeNature position statement on human–wildlife conflict 2015).

CapeNature advocates the five-step approach to holistic wildlife management of damage causing wildlife namely (1) understanding the origin of the problem; (2) maintaining the correct attitude and respect towards the animal; (3) the responsible species must be identified correctly; (4) implement suitable mitigation measures; and (5) implement effective selective control as per the information contained in the "The Landowner's guide: human-wildlife conflict – sensible solutions to living with wildlife". This handbook supplies basic and cost effective mitigation methods to landowners who report damage caused by wildlife. By implementing the suggested interventions and understanding the ecological role of each species, this will enable the Conservation Manager to deal with wildlife conflict situations both on and off protected areas.

Furthermore, the national predation management manual prepared by the predation Management Forum is also available to give management guidance on dealing with predation problems on and off protected areas. CapeNature advocates the following broad best practice guidelines:

- All reports of predators found on protected areas and causing stock losses on neighbouring properties must be reported to and investigated by relevant CapeNature staff who will assist the landowner with mitigation management. All

actions against predators must be actioned on the property where the losses occurred and not within the protected area. No hunting or pursuing of predators on any protected area is legally allowed.

- All other wildlife found on protected areas and causing losses or damage on neighbouring properties must be reported to and investigated by relevant CapeNature staff who will assist the landowner with mitigation management.
- Domestic animals (e.g. donkeys, goats, cattle, sheep and pigs) that roam onto protected areas from neighbouring properties must be addressed by relevant staff in conjunction with the local municipal authority through the draft National Animal Pounds Bill and/or any local authority bylaws.
- All feral animals (domestic animals that have become wild and without an owner) found within a protected area must be removed in a humane manner immediately.
- No confiscated, nuisance, damage-causing wildlife or rehabilitated wild animals may be released onto a protected area unconditionally.

3.5.6 Cultural resource management

CapeNature acknowledges that access to protected areas for traditional, spiritual, cultural and historical purposes has major benefits for people and accepts that protected areas have intrinsic and extrinsic use value for the people of the region. CapeNature therefore recognises the need to manage, conserve and promote natural assets for the benefit of all. CapeNature contributes towards the promotion of culture and heritage through the development and conservation of heritage resources as well as the facilitation of access.

In 2018 a Draft Cultural Historic Heritage Management Plan was compiled for the Grootvadersbosch Nature Reserve Cluster. The aim of this document is to create awareness and also enable the Protected Area Management to take care of the cultural and heritage sites within the cluster. This entails the identification and recording of sites, controlling access to the sites, and managing the sites in such a way so as to ensure that they are preserved for future generations.

3.5.7 Neighbour relations

The National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) places a duty on landowners to prepare and maintain firebreaks. Chapter 4, Section 12 (7) of the Act states that owners of adjoining land may agree to position a common firebreak away from a boundary. Firebreaks that have been repositioned off CapeNature boundaries must be documented in an official firebreak agreement between CapeNature and the relevant landowner. Firebreak agreements bind all parties over a five year period (unless otherwise stated) and are renewable upon joint agreement from both parties.

Within the structure of CapeNature, firebreak registers are used as a management tool to assist with the prioritisation and maintenance schedule for each firebreak. The firebreak register is updated annually and indicates whether a firebreak has been realigned to aid with maintenance or fire suppression operations.

Where firebreaks are constructed by the reserve away from the reserve boundary it is required to have mutual agreement in place with the adjacent landowner, the signing of many of these agreements is still in process, or to be renewed.

3.5.8 Research and development

The National Biodiversity Research Development and Evidence Strategy (2015-2025) highlights the increasing demand for knowledge and evidence to support policy and decision making for the protection of biodiversity and the realisation of benefits from our natural resources. In response to this CapeNature developed a biodiversity research and monitoring strategy. The overall goal of this strategy is to provide reliable data and knowledge to inform and facilitate the conservation of the biodiversity and sustained ecosystem functioning in the Western Cape Province.

Structured monitoring programmes need to be put in place and carried out consistently over time to monitor the state of biodiversity and ecosystem functioning. This allows tracking of ecosystem health and allows critical evaluation of management practices by employing an adaptive management cycle. Therefore, there is a focus on applied scientific research that is driven by management requirements. The strategy emphasises research and monitoring that measures biodiversity outcomes so that management can be clearly linked to the biodiversity and ecosystem function targets.

The guiding principles of the strategy are good science (robust and defensible), alignment with management requirements, taking an integrated management and ecosystems approach, employing a full monitoring lifecycle approach to planning and implementing monitoring programmes and considered (evidence-based) prioritisation of research and monitoring actions.

The CapeNature Biodiversity Research and Monitoring Strategy (CapeNature 2016) facilitates research that guides management actions in the Langeberg Complex pertaining to the following:

- Priority species (alien invasive, threatened, endemic, keystone and indicator species);
- Damage-causing animals;
- Human-wildlife conflict including social impact;
- Integrated catchment management (fire ecological management, freshwater, alien invasive species);
- Effects of resource use;
- Land-use change in the zone of influence;
- Rehabilitation and restoration, genetic processes supporting conservation;
- Ecosystem services and functioning;
- Climate change (and weather);
- Conservation management effectiveness,
- Cultural, historical and heritage sites;
- Social effects of conservation initiatives (indicators of change, awareness, value of nature as place of learning, healing and self-discovery); and
- The socio-economic effects of implementing EPWP-like work opportunities and resource economics.

3.5.9 Access

CapeNature strives to establish a differentiated and leading brand of products in outdoor nature-based tourism across the Western Cape for all to enjoy. This is achieved by providing opportunities to the public and interacting in an environmentally responsible and sustainable manner specifically to:

- Optimise income generation for biodiversity conservation;
- Optimise shared growth and economic benefits, to contribute to national and provincial tourism strategies and transform the tourism operations within CapeNature; and
- Strengthen existing and developing new products with special attention to the provision of broader access for all people of the Western Cape.

Furthermore, CapeNature strives to increase and improve stakeholder awareness, understanding and participation in environmental conservation through:

- Developing the capacity of local people to meaningfully and responsibly participate in the management and enjoyment of the protected areas.
- Educating relevant stakeholders and creating awareness around key environmental issues to increase knowledge about the environment, develop a deeper understanding about environmental principals and encourage environmentally conscious values that allow for more informed and environmentally responsible decision making.

As part of its multi-sectoral approach, CapeNature aims to support the Western Cape Education Departments efforts through presenting curriculum aligned Environmental Education Programmes to schools and will endeavour to collaborate with like-minded partners in pursuit of environmental sustainable development goals as platforms for involving citizens and groups with the aim of expressing a "call to action". Behaviour change efforts will be optimised through targeting specific audiences with innovative, transformative, quality assured programmes and interventions.

3.5.10 Administrative framework

The Directorate: Conservation Operations is divided into two Regions, namely East and West. The East Region is divided up into two Landscapes, namely South and East.

The Langeberg Complex is one of eight protected area complexes that occurs within the organisation's East Region. The Complex is supported primarily though Head Office, through the Landscape Office located in Walker Bay. All Landscape administrative matters that affect the Complex are managed via Head Office.

Conservation Managers report to the Landscape Manager of the South Landscape, based at Walker Bay in Hermanus. Protected areas are supported by the Landscape Manager: East, based in George. The Langeberg Complex has three main operational centres, namely Marloth, Grootvadersbosch and Geelkrans. The staffing structure for the Langeberg Complex is depicted in Figure 3.3.

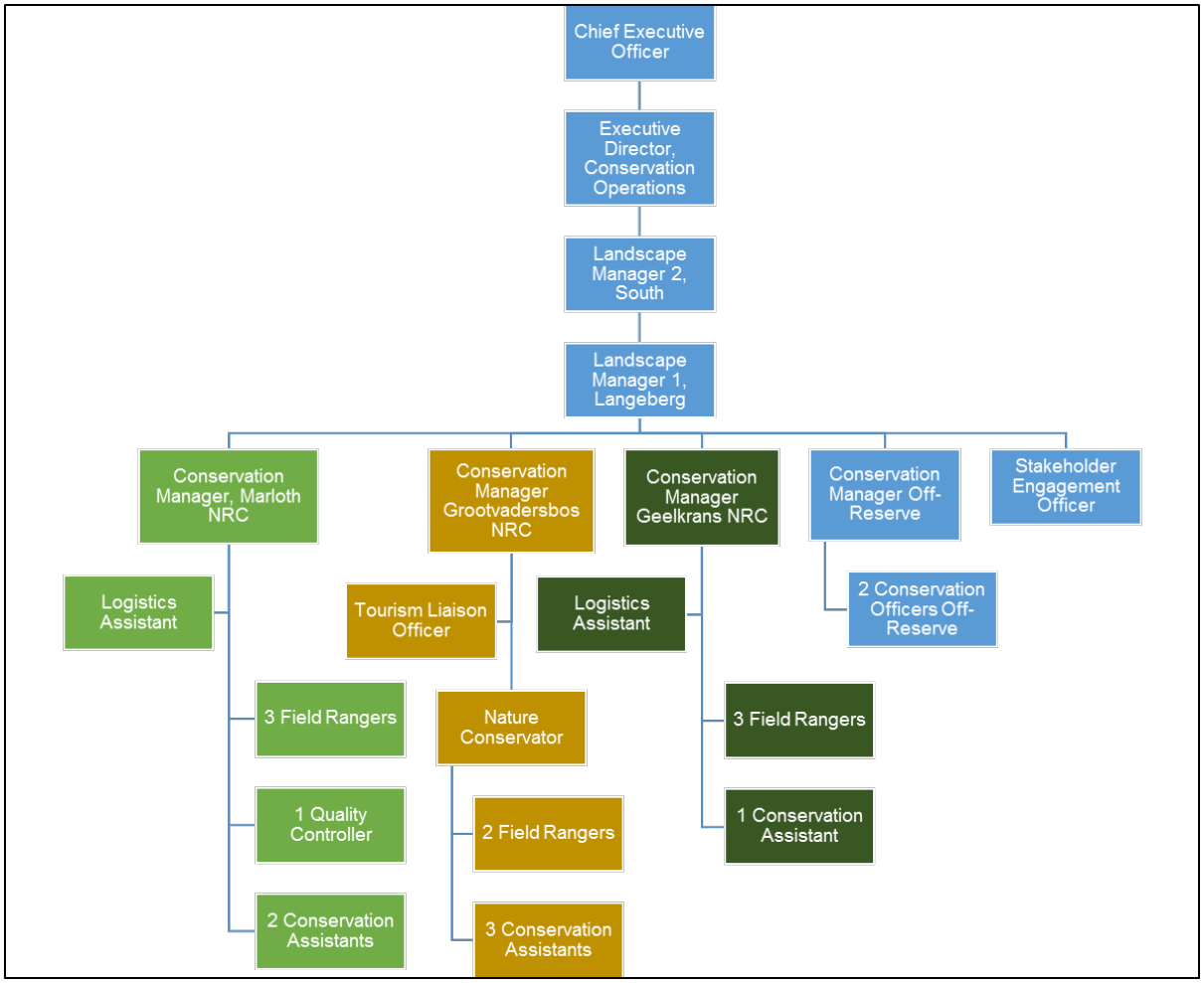

Figure 3.3: Approved organogram for the Langeberg Complex.

4 CONSULTATION

This section outlines procedures for public participation during the development of the management plan, including formal processes for public comment on the draft plan, and establishes procedures for public participation during the implementation phase of this plan (Figure 4.1).

Stakeholder engagement takes place throughout the adaptive management cycle and enables public participation essential for sustainability, builds capacity and enhances responsibility. It promotes communication and the derivation of new information and/or expertise.

At the outset of the planning process for the Langeberg Complex, a stakeholder analysis identified relevant internal and external stakeholders, and defined the scope and purpose of engagement.

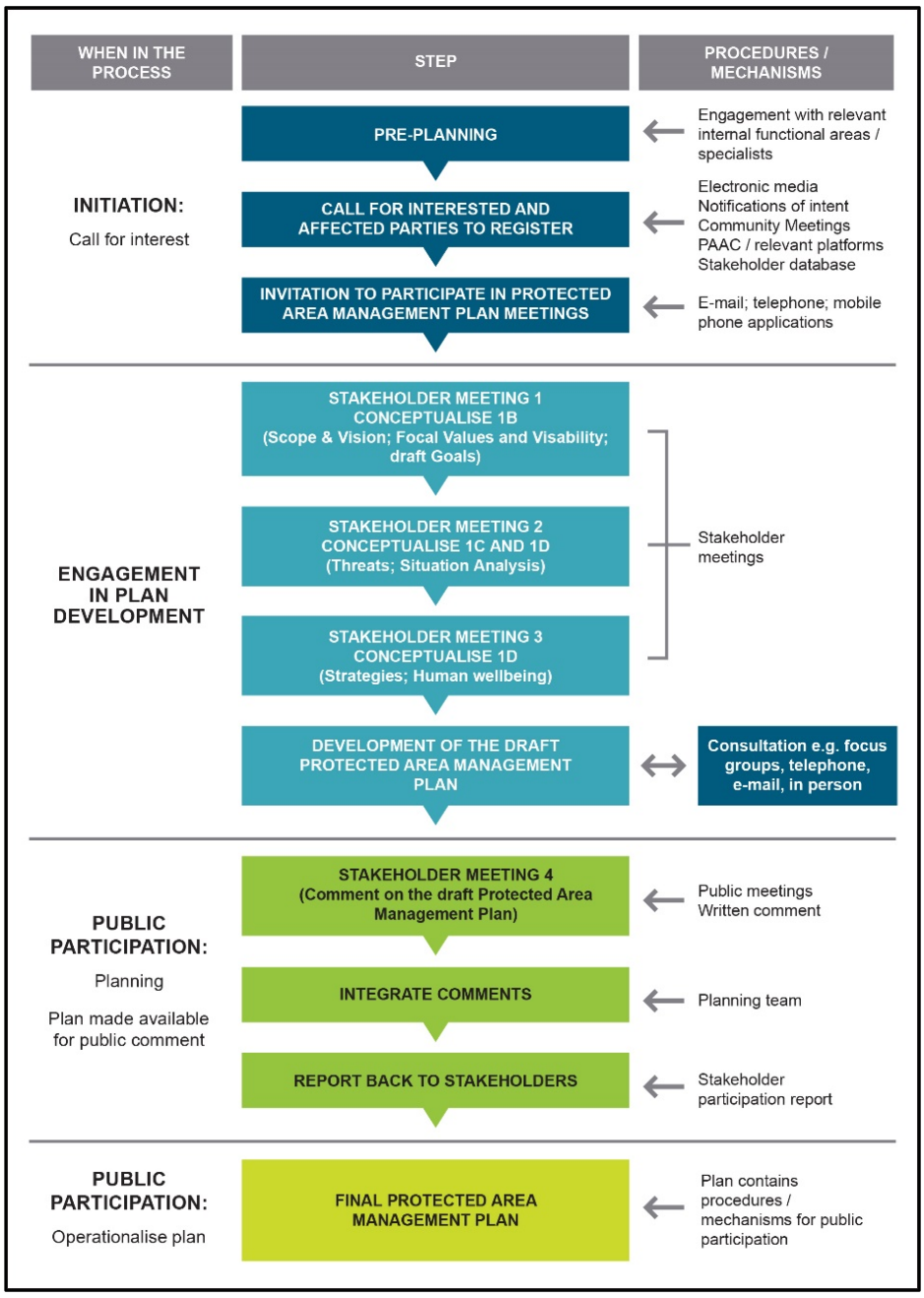

Figure 4.1: Process flow for Protected Area Stakeholder Engagement.

4.1 Stakeholder Engagement

4.1.1 Participatory planning

Several approaches to engaging internally and externally with stakeholders were applied, including structured facilitated workshops, meetings, site visits and the provision and circulation of information for input. Different stakeholders were engaged using varied approaches during the stages of the planning process, from gathering and sharing information, to consultation, dialogue, working groups, and partnerships. The degree of engagement was guided by the stakeholder analysis and in response to the need (i.e. transparency of process / expert opinion / buy-in and support, etc.).

During 2018 and 2019 a series of expert-facilitated stakeholder workshops, coordinated and hosted by CapeNature, were held. A range of stakeholders representing individuals or agencies with an interest in, and / or knowledge / expertise of the landscape, and individuals or agencies with the capability to support the implementation of the Langeberg Complex management plan were involved. Stakeholders included landowners and land managers (private and communal), and relevant land or resource management authorities. Workshops were aimed at developing a strategic framework for the Complex to help coordinate efforts in the landscape towards a common vision. The desired outcomes were to capacitate stakeholders in the understanding of the natural and cultural focal values in the Complex landscape and to identify mechanisms to maintain those values over time.

The outcomes of the above-mentioned process were precursors to the site-specific management planning process for the Langeberg Complex and formed the foundation for smaller working groups towards the development of the management plan. The Complex management planning process was further facilitated by the core planning team comprised of CapeNature conservation manager, landscape conservation intelligence manager, landscape ecologist, ecological coordinator, off-reserve conservation manager/officer, stakeholder engagement manager/officer and landscape manager. A series of workshops and core planning team meetings were held with relevant internal and external stakeholders.

4.1.1.1 Key stakeholder groups engaged

- Communities (Heidelberg, Slangrivier, Still Bay, Melkhoutfontein, Swellendam, Barrydale, Montague, Ashton and Suurbraak);
- Private landowners;
- Resource managers mandated to manage the land for conservation
    - SANParks;
    - private landowners; and
    - Breede Gouritz Catchment Management Agency.
    - Municipalities (local authority nature reserves)
    - Southern Cape Fire Protection Association.

- Government agencies mandated to support and regulate land and water management and other relevant affairs
    - Department of Agriculture, Rural Development and Land Reform (DARDLR):
    - Department of Agriculture (Western Cape)
    - Department of Agriculture, Forestry and Fisheries: Compliance;
    - Department of Environmental Affairs and Development Planning (DEA&DP): Integrated Coastal Management;
    - Department of Environment, Forestry and Fisheries: Oceans and Coast;
    - Department of Environment, Forestry and Fisheries: Protected Areas
    - Department of Agriculture: LandCare.

- Government Agencies mandated to support and regulate heritage management
    - Heritage Western Cape.

- Local authorities
    - Garden Route District Municipality;
    - Overberg District Municipality
    - Cape Winelands District Municipality;
    - Hessequa Municipality;
    - Swellendam Municipality;
    - Langeberg Municipality; and
- Non-governmental organisations (NGO)
    - Table Mountain Fund (TMF);
    - Botanical Society – Custodians of Rare and Endangered Wildflowers;
    - WWF-SA.
- Tertiary Institutions
    - Stellenbosch University;
    - University of the Western Cape; and
    - University of Fort Hare.
- Other interested and affected parties who support and / or work in the planning domain
    - Gouritz Cluster Biosphere Reserve;
    - Stilbaai Interest Forum;
    - Stilbaai Conservancy;
    - Grootvadersbosch Conservancy;
    - Goukou River Property Owners Association;
    - Railton Foundation; and
    - Friends of Marloth.

To date approximately eight targeted stakeholder engagements have been initiated and facilitated with the nine above-mentioned stakeholder groupings through the following mechanisms:

4.1.1.2 Workshops

Stakeholder Workshops had the following key themes:

- Planning purpose: introducing stakeholders to planning for adaptive management; planning scope and vision;
- Conceptualisation: capacitating stakeholders in adaptive management planning; selecting focal values and assessing the condition of focal values; threats assessment and conservation situation analysis;
- Planning actions: identifying strategies; developing theories of change and developing objectives and indicators.
- Internal stakeholder engagement: scientific review and component review.

Two external organisations (total of 5 people) attended the workshops out of all the organisations invited to attend (Figure 4.2).

Figure 4.2: Stakeholder participation in the Langeberg Complex. Photo: AnneLise Schutte-Vlok.

4.1.1.3 Working groups and other input opportunities

In instances where specific input was required or stakeholders and / or experts were unable to participate in workshops, smaller teams engaged and / or public meetings were facilitated to:

- Share workshop outputs and progress, and test the rationale of situation analyses, for example meetings with formerly Scientific Services related to taxon and habitat specific planning;
- Address relevant knowledge gaps and test rationale, for example, program managers and taxon specialists were consulted to find mechanisms to address knowledge gaps in areas where needed; Marine specialists were contacted to fill marine-related knowledge gaps.
- Provide opportunities for specific community engagements to reach as many individuals as possible via platforms such as the GCBR Forum meeting (reaching 63 people of which are private landowners, community members, and from various other organisations);
- Facilitate information sessions and registration of interest with community members.

4.1.2 Procedures for Public comment

A process inviting the public, interested and affected parties to register their interest and comment on the draft management plan was initiated via the media (notifications were placed in two local newspapers – Suid-Kaap and Langeberg Bulletin), electronic media e.g. CapeNature's website, e-mail and telephone.

Furthermore, the draft management plan was placed at public libraries in Heidelberg, Duivenhoks, Riversdal, Barrydale, Railton and Swellendam. The draft management plan was also available at CapeNature offices at Marloth, Grootvadersbosch and Geelkrans Nature Reserves, and available on the CapeNature website. Written comment was invited on the draft management plan for a period of 30 days. The stakeholder participation process was initiated on 30 October 2019 and was concluded on 17 December 2019.

Registered interested and affected parties were invited to a public meeting and provided the opportunity to provide information and express their opinion. Three meetings were held in Stilbaai at the Melkhoutfontein Community Hall at 17:00 on the 19/11/20, Riversdal at the Thusong Centre at 09:00 on 19/11/21 and Swellendam at the Town Hall at 14:00 on 19/11/21. In total 18 external stakeholders attended these meetings. Based on a comprehensive stakeholder engagement process report of the outcomes of the public meeting, as well as written comments and responses received, the management plan was amended where relevant, and feedback provided to registered interested and affected parties. A stakeholder register, maintained by the Reserve Management Committee, lists registered interested and affected parties as well as comments received and responses by the reserve management committee.

Please refer to Appendix 3 – Stakeholder Engagement Report for the Langeberg Complex.

4.1.3 Procedures for Participatory Implementation

4.1.3.1 Protected Area Advisory Committee

Participatory management is facilitated through structures such as Protected Area Advisory Committees (PAAC) with the aim of regular interaction with stakeholders and a mechanism to evaluate stakeholder feedback, to promote good neighbour relations and to influence beyond protected area boundaries. The organisation of the PAAC for the Langeberg Complex is as follows:

- The Marloth PAAC, established in 2016. Representation is largely by Swellendam residents and discussion points generally pertain to sustainable harvesting and recreational activities within the nature reserve.
- The Grootvadersbosch PAAC, established in 2017. Representation is largely by Heidelberg, Slangrivier and surrounding farms. Discussion points generally pertain to conservation.
- The Goukou PAAC, established in 2002, is mainly represented by community members of Still Bay and Melkhoutfontein. Key themes include topics such as access, environmental projects, youth development and environmental awareness.

4.1.3.2 Other mechanisms for stakeholder engagement

Enhancing engagement and participation by relevant stakeholders throughout the Langeberg Complex is a key focus area going forward. Current structures for stakeholder engagement, additional to the PAAC, include:

- The Western Cape Stewardship Reference Group and the GCBR serve as platforms for conservation implementation by partners.
- The National People and Parks Programme implemented by CapeNature has established a regional structure in the area to enable community engagement. The primary objective is to link communities with relevant government departments that can assist with issues such as access for marine resource utilisation or for spiritual, recreational, educational, traditional and other purposes. The programme is also designed to capacitate communities with regard to relevant legislation, policies and regulations.
- Through the Comprehensive Rural Development Programme, CapeNature partners with NGOs, government departments and communities. The Council of Stakeholders is an elected structure of representatives from communities and focus areas include access, job creation opportunities, youth development, and Small, Medium and Micro-sized Enterprise (SMME) development.
- Other platforms for engagement include the Friends of Marloth, Railton Foundation, Conservation at Work, Stilbaai- and Grootvadersbosch Conservancies.

5 PURPOSE AND VISION

This section makes provision for CapeNature to manage the Langeberg Complex exclusively for the purpose for which it was declared. It presents the vision, purpose, focal values and key threats foundational to developing the desired state for the Complex.

The desired state, articulated as goals in this management plan, defines the outcome of management and directs management within and beyond protected area boundaries. This serves as a foundation for appropriate ongoing monitoring and evaluation to assess management effectiveness.

5.1 Management Intent and Desired State

The Langeberg Complex is situated in the Greater Cape Floristic Region and forms part of the CFRPA World Heritage Site. The Langeberg Mountain range is part of the Langeberg phytogeographical centre with over 2,360 species and endemism at 11.7% (Goldblatt and Manning 2000), and creates a link between the western and southern mountains of the CFR. In addition, the Complex forms part of the GCBR that aims to create a conservation corridor along the Gouritz River to ensure that the inland section is directly linked to the coastal environment.

The Langeberg Complex aims to strategically, and adaptively, manage biodiversity towards ensuring the persistence of an intact natural climate change corridor, marine and freshwater ecosystems, and unique cultural and biological diversity of the region through: 1) the prioritised strategic management of threats; 2) improving the condition of terrestrial, freshwater and coastal resources through integrated catchment

management; 3) ensuring that properties comprising the Complex are legally secured and protected area design is augmented by expansion through stewardship or other effective means, including the 'zone of island influence'; 4) cooperative governance to overcome regulatory division in the management of coastal and freshwater resources; and 5) managed access to facilitate sustainable, responsible access and tourism.

5.2 Purpose

The Boosmansbos Wilderness Area was one of the first to be demarcated as a State Forest by proclamation in 1896 and as a Wilderness Area in 1978 in terms of the Forest Act, 1968 (Act No. 72 of 1968) with the aim to allow natural processes to operate without hindrance by humans. The management thereof was mandated to the Western Cape Provincial Administration in 1986. The Boosmansbos Wilderness Area was furthermore inscribed as part of the CFRPA World Heritage Site in 2004 due to reserve integrity and appropriate physical, institutional and legal protection, to ensure long-term conservation of species and natural processes. The Boosmansbos Wilderness Area satisfied four criteria that were used to select areas to include into the World Heritage Site, namely that it is surrounded by conservation-friendly land, had high management integrity in terms of conservation and management status, was relatively large and is a biological "hotspot" (*e.g.* high species diversity, endemicity, occurrence of threatened taxa, and operation of supporting natural processes).

The rest of the Langeberg Complex (excluding the coastal sections) was nominated as an extension of the CFRPA World Heritage Site in 2015 (IVC 2015). The primary reasons for inclusion of this Complex into the extension nomination for the CFRPA were to improve representation of vegetation types within the CFRPA, as well as to increase and improve the overall size, connectivity and integrity of the CFRPA, thus ensuring protection of an increased land area within the World Heritage Site. The extended Langeberg Complex improves connectivity between the inscribed De Hoop, Swartberg Complex and Boosmansbos Wilderness Area components and form a critical east-west link along the Langeberg range, between the inscribed CFRPA and the proposed CFRPA extensions of the Garden Route Complex, Riviersonderend- and Anysberg Nature Reserves. The inclusion of the Langeberg Complex into the inscribed CFRPA increases resilience in the face of global climate change and improves both biodiversity pattern and process of the inscribed CFRPA World Heritage Site.

The Stilbaai MPA was declared with the intention to protect and conserve the coastal environment and the marine living resources that are found in and around Still Bay and, thereby, protect the estuary's reproductive capacity for exploited fish species and serve as a nursery to recruit estuarine- dependant fish into marine fisheries.

According to Section 17 of the NEM: PAA each protected area in the Langeberg Complex is declared for one or more of the following purposes:

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.

5.3 Vision

The vision for the Langeberg Complex is:

The Langeberg Complex World Heritage Site conserves living land- and seascapes through partnerships for the benefit of all generations.

5.4 Focal Values

In consultation with stakeholders, natural and cultural historic focal values were identified, explicitly defined, and selected for their ability to represent the full suite of biodiversity and cultural historic heritage within the Langeberg Complex.

Focal values are summarised in Table 5.1. Features considered to be nested within or catered for by the conservation of the focal value, are noted. Key human wellbeing values derived from the tangible natural and cultural focal values are also noted. Since human wellbeing values are those components of wellbeing affected by the status of tangible natural or cultural values, their 'health' or status is not assessed separately, but seen as contingent upon the status of the natural and cultural focal values selected.

Table 5.1: Summary of the Langeberg Complex focal values and viability as at 2019.

Focal Value	Description, nested values, key attributes and associated human wellbeing values	Current Status
Fynbos Mosaic	**Description:** The Mountain Fynbos constitutes 19 distinct vegetation types of which two are Critically Endangered and four are Endangered. Fifty-five fine scale vegetation units has been identified. **Nested values of note:** Afromontane Forest, coastal vegetation, Serotinous Proteaceae, associated fauna and flora communities. **Key attributes:** Fire frequency, fire season, fire size, post-fire recruitment ratio of serotinous Proteaceae, percentage Afromontane forests burnt, Indigenous vegetation species composition (%), Indigenous coastal vegetation species cover (%), Ecotypical species populations (Bushbuck). **Associated human wellbeing value(s):** Freedom of choice and capacity to act independently, tourism and nature based economic opportunities; Security from natural disasters; Water Security and environmental resilience.	**Good**
Succulent Karoo	**Description:** The Succulent Karoo occurs on Thornhill (Doornkloof) Nature Reserve and constitutes three distinct vegetation types and six fine scale vegetation units. **Nested values of note:** Associated fauna and flora communities.	**Very Good**

Focal Value	Description, nested values, key attributes and associated human wellbeing values	Current Status
	Key attributes: Indigenous vegetation species composition (%), percentage cover by disturbance indicator species (e.g. *Atriplex*, *Nerium*, *Tamarix*, *Arundo*, etc.), intactness of heuweltjies, occurrence of localized endemics on quartz patches and population health, ecotypical species populations - Steenbok (*Raphicerus campestris*) **Associated human wellbeing value(s):** Freedom of choice and capacity to act independently, tourism and nature based economic opportunities.	
Freshwater Ecosystems	**Description:** Comprising of all natural seasonal rivers, streams, seeps and wetlands. **Nested values of note:** Freshwater invertebrates, fish communities, riparian zone, lowland and high altitude wetlands and seeps, rivers. **Key Attributes:** Wetland Ecosystem Health, native vegetation structure and species composition within riparian zone (%), intact wetland buffers, indigenous invertebrate species composition, freshwater fish species composition (includes threatened fish species, Barrydale redfin, Breederiver redfin, Cape kurper, Cape galaxias, freshwater eels), river flow regime. **Associated human wellbeing value(s):** Freedom of choice and capacity to act independently, tourism and nature based economic opportunities; Security from natural disasters; Water Security and environmental resilience.	**Good**
Estuarine Environment	**Description:** Goukou estuary **Nested values of note:** migratory fish species, estuarine fish, coastal ecosystem, drift sands dune systems, Indian humpback dolphin (estuary dependent). **Key attributes:** Quality of the estuarine environment, water quality, intact riparian habitat, water associated avifaunal assemblages. **Associated human wellbeing value(s):** Freedom of choice and capacity to act independently, tourism and nature based economic opportunities; Security from natural disasters; Water Security and environmental resilience, and food sources.	**Fair**
Marine Environment	**Description:** Stilbaai Marine Protected Area. **Nested values of note:** Marine environment (Stilbaai); rocky shore species (e.g. oysters, mussels); endemic reef fish; reef fish; intertidal zone; marine nearshore (high and low profile reef systems). **Key attributes:** Healthy rocky shore and sandy shore communities, Agulhas mixed shore intact reefs and a functioning marine-estuarine link. **Associated human wellbeing value(s):** Freedom of choice and capacity to act independently, security from natural disasters, tourism and nature based economic opportunities.	**Fair to good**
Cultural Heritage and Rural Landscapes	**Description:** All heritage assets including pre-colonial heritage, artificial historical structures; rural landscape that gives character to the area which attracts visitors/tourists to the area. **Nested values of note:** Pre-colonial heritage (rock art sites), artificial historical structures (e.g. fish traps or visvywers at Stilbaai); rural landscape that gives character to the area which attracts visitors/tourists to the area. **Key attributes:** Access for sustainable utilisation of Natural Resources, rural and natural character, sustainability of traditional activities, the	Good

Focal Value	Description, nested values, key attributes and associated human wellbeing values	Current Status
	conservation state of the rock art, archaeological artefacts and deposits and artificial historical structures. **Associated human wellbeing value(s):** Freedom of choice and capacity to act independently, tourism and nature based economic opportunities, maintaining historical fishing practices as a food resource.	

As the public entity responsible for nature conservation in the Western Cape, CapeNature delivers a suite of core services to the public towards the following outcomes: resilient ecosystems that provide water and other eco-system services; the promotion of local economic development, job creation and skills development; growing diversified nature-based revenue streams; access to environmental education, advocacy and education, and access to natural and cultural heritage. Human wellbeing is articulated as an outcome of conservation and is illustrated in Table 5.2. These focus areas are essential to the effective execution of this management plan and achievement of goals.

Table 5.2: Human wellbeing values of the Langeberg Complex.

Human wellbeing values	Description and Associated Benefits	Current Status
Freedom of choice and capacity to act independently, tourism and nature based economic opportunities.	**Description:** Socio-economic development is sustainably facilitated and maintained. Ecosystems are intact and healthy and thus add economic value to ecotourism products that are in line with zonation. **Key attributes:** Access to employment opportunities, access to capacity and skills development opportunities, tourism infrastructure, access to environmental awareness and education opportunities, mechanisms to enable tourism enterprises (e.g. small, medium and micro enterprises), intact ecosystems and abundant wildlife.	**Good**
Security from natural disasters.	**Description:** A healthy and intact environment provides security from natural disasters such as wild fire, drought and flooding for the benefit of the target communities. **Key attributes:** Natural protection from flooding, erosion, siltation etc., Environmentally sound development, Mechanisms to enable coordinated disaster management.	**Good**
Water Security and environmental resilience	**Description:** Healthy ecosystems protect and enhance the provision of water quality and quantity and contributes to the water resilience for the Breede-Gouritz catchment management area. **Key attributes:** Access to clean water in sufficient quantity.	**Good**

5.5 Threats

Protected area management aims to mitigate threats to values, either through direct threat mitigation, or through mitigation or management of a factor contributing to or driving the threat. Threats to focal values and the relevant contributing factors of key threats need to be described in sufficient detail to support effective planning and management.

Threats assessment influences the direction and effectiveness of management options. Rating threats according to scope, severity and irreversibility of impact facilitates the allocation of limited resources, simplifies complex scenarios and provides a systematic decision support method to focus efforts.

Table 5.3 provides a summary of focal values against key threats for the Langeberg Complex.

Table 5.3: A summary rating of critical threats, highlighting the natural and cultural historic focal values at greatest risk within the Langeberg Complex.

Focal Values	Critical Threats	Threat Rating
Fynbos Mosaic	Urban expansion, commercial and industrial developments, agricultural expansion, inappropriate fire regime, recreational activities, illegal harvesting, alien invasive vegetation.	**Very High**
Succulent Karoo	Climate change (prolonged drought periods), inappropriate land management practices, poaching, alien invasive vegetation.	**Low**
Freshwater Ecosystems	Climate change (prolonged drought periods, severe flooding events), invasive alien species, instream and riparian modification.	**Very High**
Estuarine Environment	Climate change (prolonged drought periods, severe flooding events), invasive alien plants, instream and riparian modification, over abstraction of surface and ground water, inappropriate land management practices, water pollution, urban expansion, commercial and industrial developments, unsustainable and illegal harvesting of resources in the marine and estuary environment.	**Very High**
Marine Environment	Climate change (prolonged drought periods), water pollution, urban expansion, commercial and industrial developments, unsustainable and illegal harvesting of resources in the marine and estuary environment.	**Very High**
Cultural Heritage and Rural Landscapes	Climate change (prolonged drought periods), inappropriate fire regime, Recreational activities.	**High**

The results of the above threat rating highlighted the following key threats affecting the focal values of the Langeberg Complex as outlined in Table 5.4 below:

Unsustainable and illegal harvesting of resources in the marine and estuary environment: Harvesting and utilisation of natural resources without authorisation undermines appropriate resource management. This threat is significant for the Marine and estuarine environments. Bait collection poses a threat to non-targeted species, e.g. amphipods, and can lead to the degradation of certain habitats (CSIR 2011). Historically illegal netting was a major activity that significantly compromised the nursery function of the Goukou Estuary. At present this aspect is deemed to be under control but compliance needs to be verified and upheld. Overfishing in the Goukou Estuary has broader implications for the fishing industry since the estuary serves as an important breeding ground and nursery for marine species. This aspect is currently under control through firm compliance management. Unregulated utilisation can be

attributed to regulatory division between relevant authorities, which presents an opportunity for improved collaboration and cooperation between authorities. Additionally, there is opportunity for improved environmental awareness and management authority understanding of resource utilisation trends.

Instream and riparian modification: Instream infrastructure interferes with the natural hydrodynamics of the Goukou system under high flow conditions. Artificial bank stabilization associated with instream infrastructure such as jetties introduces foreign habitats to the system (CSIR 2011).

Over abstraction of surface and groundwater: This is a threat to the freshwater ecosystems and estuarine environment. Increased abstraction of groundwater is likely to introduce ecological impacts for freshwater (rivers and wetlands) and terrestrial ecosystems in the Langeberg Complex. Over abstraction and the associated effects of drawdown (reduction of the hydraulic head in an aquifer / well due to pumping) and impact on groundwater-dependent ecosystems are not yet well understood. Abstraction of groundwater for agricultural purposes is a threat to the water quality in the Breede River, as well as potentially leading to a drawdown of groundwater tables particularly in lower-lying areas (IVC 2014). The various environmental-, conservation- and water management authorities are well aware of the potential issues and challenges and monitoring programmes for water quality in the Breede River are ongoing. The over-allocation of water resources in the catchment deprives the Goukou Estuary of the freshwater necessary to sustain a healthy ecosystem. The decreased flow could contribute to sedimentation in the upper and lower reaches of the estuary. Freshwater fountains along the system serve as unique ground water dependent habitats that link the aquatic and terrestrial environment. Over-exploitation of groundwater resources could cause these fountains to cease providing a habitat that nurses eels (CSIR 2011).

Water pollution: Pollution poses a threat to the freshwater ecosystems, estuarine- and marine environments, particularly effluent from sewage systems or storm water runoff which leads to increased concentrations of organic compounds in the estuary. Poor water quality poses a threat to environmental and human health in the Goukou Estuary (CSIR 2011). Siltation is the one of the largest threats to the Goukou Estuary system, where rates are greatly increased by a number of human activities.

Agricultural expansion: Agricultural practices such as planting vineyards and olives too near to the river banks causes erosion and increase silt deposition in the Goukou Estuary (Du Toit & Attwood 2008). Pollutants (leached fertilizers and agrochemicals) from farming activities in the Goukou catchment and surrounding environments pose a threat to the Goukou Estuary ecosystem. Saltmarshes and natural wetlands in the region are damaged by domestic animal grazing. This leads to reduced productivity, habitat destruction and ultimately bank erosion (CSIR 2011). The clearing of riparian vegetation to gain access to recreational areas leaves the Goukou Estuary's banks vulnerable to erosion.

Urban expansion, commercial and industrial developments: The various development pressures on the components of the Langeberg Complex are mostly focused on the lower-lying areas near urban development and on the coastal plain to the south of the Langeberg Mountain Range (IVC 2015). Within the Geelkrans Nature Reserve Cluster existing road infrastructure encroaches on the Goukou Estuary and

floodplain reducing its resilience to deal with development pressures (CSIR 2011). Developments in the littoral zone of the sandy beach, including breakwaters, groynes or buildings may result in erosion of the beach or sand inundation of buildings. Artificially stabilising the dunes with vegetation or removing the fore dunes for development will remove the reservoir that that supplies sand to the beach (Du Toit & Attwood. 2008). Damming of the river for irrigation and drinking water purposes reduces the input of freshwater and alters the river flow patterns. The bridge that connects Still Bay East from Still Bay West can interfere with tidal action and upset the natural estuarine flow and circulation. Saltmarshes and natural riparian vegetation in the Goukou system have been, and continue to be, degraded by low-lying developments and infrastructure. This encroaches on natural buffers and unique estuarine habitats along the estuary and reduces the mitigation effect that natural vegetation provides against wave action (caused by tidal action and water-skiing) and floods (CSIR 2011). Housing developments (Figure 5.1) along the southern and western boundaries of the Geelkrans Nature Reserve Cluster are accompanied by a number of threats, namely wildfires, domestic animals, littering, *etc.* Stray dogs and sometimes poachers from these settlements enter the reserves to hunt Bush Buck and other smaller game.

Figure 5.1: Development along the Goukou Estuary. Photo: Jean du Plessis.

Invasive alien plants: The fynbos mosaic, freshwater ecosystems and estuarine environment are threatened by invasive alien flora. *Pinus*, *Hakea* and Australian *Acacia* species are amongst the most problematic woody invasive species in the

CapeNature managed Nature Reserves and the surrounding areas, although several other species, such as *Schinus molle* and *Tamarix* species, are also problematic in the broader Gouritz area (Lombard *et al.* 2004). Invasions by alien tree species in particular have exacerbated habitat loss due to human activities (Cowling & Richardson 1995; Le Maitre *et al.* 2000; De Lange & Van Wilgen 2010; Moran & Hoffmann 2012). Invasive tree species have invaded an estimated 10 million ha in South Africa by 1997 with the fynbos biome being the worst affected (Le Maitre *et al.* 2000; Van Wilgen *et al.* 2001). Furthermore, invasive alien trees have a major negative impact on our limited water resources and it is estimated that 6.7% of the water runoff of the entire country is used by these plants (Le Maitre *et al.* 2000; Van Wilgen *et al.* 2008; Van Wilgen & De Lange 2011). Moreover, it has been argued that the future impacts of invasive alien species may be much higher than anticipated, especially on surface water runoff, groundwater recharge and biodiversity (Van Wilgen *et al.* 2008), and will in all likelihood continue to spread faster than they can be cleared (Van Wilgen *et al.* 2016). The water yield from mountain catchments invaded by invasive alien species may reduce by more than 30% over 20 years of invasion (Van Wilgen *et al.* 2001).

The presence of invasive alien plant species within the riparian zones has been identified as a threat to river ecosystems and the estuarine environment in the Langeberg Complex. Samways *et al*. (2010) recommends that the removal of invasive alien trees should be prioritised for maintenance of the riparian zones, especially for rivers in the high water yield catchments.

Inappropriate fire regime: Too frequent or ill-timed fires have far-reaching ecological impacts. The majority of fires are human induced either through accidental ignition or are intentionally set. In addition, there are still too many management burns actively pursued and applied outside of the natural burning window. In order to reduce the incidence of wildfire in the Langeberg Complex and surrounding areas, various FPAs have been established and Working on Fire teams are based at Marloth and Grootvadersbosch Nature Reserves. Many private landowners (especially farmers) in this region are actively involved in fire prevention, detection and fire-fighting through their membership with the FPAs as well as through the GCBR.

Uncontrolled recreational activities: A variety of facilities, activities and opportunities are available for visitors to the Langeberg Complex including mountain biking, hiking, boating, birdwatching and a spectrum of environmental education opportunities. These are controlled through appropriate zonation of the various component conservation areas as well as access control requiring permits for areas where excessive visitor pressures might be harmful or otherwise cause degradation. Where visitor pressures might cause damage, visitor numbers are limited through a permit system and some particularly sensitive areas are maintained as being “off limit” to the general public. Inadequate resources to manage the use of the Goukou River estuary by power boats, particularly during the peak holiday seasons, is of concern. Exceedance of the system’s power-boating capacity can lead to bank erosion and endangering the safety of other recreational users. Kite and windsurfing can endanger bathers and disturb feeding birds.

Climate change can have significant environmental, social, cultural and economic consequences for natural and social systems. Although the effects of climate change are speculative, it is likely to have major impacts such as an increase in the frequency

of extreme weather events (for example droughts, floods and storm surges), habitat shifting and alteration, a hotter and drier climate and a rise in sea level. The focal values of the Langeberg Complex link to the landscape being a priority climate change adaptation and mitigation corridor within the Western Cape.

Table 5.4: Rating of key threats applicable to the Langeberg Complex.

Threats	Associated Values	Summary Threat rating
Unsustainable and illegal harvesting of resources in the marine and estuary environment	Marine environment, estuarine environment	**Very High**
Water pollution	Freshwater ecosystems, marine environment, estuarine environment	**High**
Instream and Riparian Modification	Freshwater ecosystems, estuarine environment	**High**
Alien Invasive Plants	Fynbos mosaic, freshwater ecosystems, estuarine environment	**High**
Urban expansion, Commercial and Industrial Developments	Fynbos mosaic, estuarine environment, marine environment	**High**
Over abstraction of Surface and Ground Water	Freshwater ecosystems, estuarine environment	**High**
Agricultural Expansion	Fynbos mosaic	**High**
Uncontrolled Recreational Activities	Fynbos mosaic, freshwater ecosystems, estuarine environment, marine environment, cultural heritage and rural landscape	**Medium**
Inappropriate fire regimes	Fynbos mosaic, freshwater ecosystems, cultural heritage and rural landscape	**Medium**

5.6 Goals

Clear and measurable outcome-based goals, strategies and objectives are fundamental for the assessment of protected area management effectiveness and to the whole process of management itself. Based on the viability and threats assessment, a desired future condition was established for focal values and core service areas by setting measurable, time-bound goals directly linked to the values and their key attributes.

Langeberg Complex Goals:

To maintain the healthy ecological infrastructure that supports life on earth and climate change resilience, management needs to achieve the following:

1. By 2030, the Fynbos mosaic in the Langeberg Complex has an ecologically healthy fire regime* and comprises 95% indigenous species and reseeding Protea species are represented as per historic data**.

*Three veld age classes fall between 5-20% of the Protected Area, 75 - 90% of the area burnt during December-April, fire return intervals Southern slopes: >15 years since last fire; Northern slopes: >20 years, 0% of Afromontane forest has burnt; **According to the Protea Atlas data.

2. By 2030, the Succulent Karoo vegetation mosaic within the Langeberg Complex will consist of 99% indigenous vegetation and ecotypical species populations will remain stable.

3. By 2030, the wetland buffer and riparian zones** of the Langeberg Complex will have 80% natural vegetation.
   ** Definition in National Water Act, 1998 (Act No. 36 of 1998) of riparian zone

4. By 2030, the upper and middle river reaches in the Langeberg Complex supporting macro invertebrate species communities represent an ASPT of 6-8 with >50% of expected fish species present in at least two age classes and have a natural flow regime*.
   *100% flow for all portions except Kruis River, which should be more than 80%.

5. By 2030 the health of the Langeberg Complex wetland ecosystems will be in a natural (A)* to near-natural (B)** condition.
   *Unmodified;
   ** A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.

6. By 2030 the estuarine health index category of the Goukou estuary will be Category B*.
   *As defined in the Goukou Situation Assessment Report prepared by the CSIR (2011).

7. By 2030 there will be an increase in abundance and presence of depleted, endangered and endemic reef species in the near shore zone of the Stilbaai Marine Protected Area.

8. By 2030 the health* of the intertidal zone of the Stilbaai Marine Protected Area will be maintained from the current baseline state.
   *Stable populations of indicator species of the south coast/Agulhas mixed zone.

9. By 2030 unnatural disturbances to heritage features are limited to maintain current conditions within the Langeberg Complex.

10. By 2030 natural resources within the Langeberg Complex are managed equitably for legitimate access, are in accordance with CapeNature policy and procedures and is taking place in such a way that they will be available for current and future generations.

Achieving human well-being, derived from healthy responsibly-managed ecological infrastructure and heritage, requires that:

11. By 2030 access to environmentally responsible infrastructure*, intact ecosystems and optimal biodiversity adding economic value to ecotourism products and socio economic development is sustainably facilitated and maintained.
    *Aligned with the zonation scheme.

12. By 2030 the Langeberg Complex provides managed opportunities for accessing nature and nature-based activities in a manner which is not harmful to the natural environment.

13. By 2030 the coordinated disaster management plan will promote and facilitate security from natural disasters, for example (but not limited to) wild fire, drought and flooding for the benefit of the target communities.

14. By 2030 the Langeberg Complex will, through integrated catchment management, protect and enhance the provision of water quality and quantity contributing to the water resilience for the Breede-Gouritz catchment management area.

5.7 Sensitivity Analysis

Sensitivity analysis based on the Langeberg Complex's biodiversity, heritage and physical environment is a key informant for spatial planning and decision-making in protected areas. Sensitivity analysis aims to:

- Highlight areas containing sensitive biodiversity and heritage features;
- Inform all infrastructure development *e.g.* location of management and tourism buildings and precincts, roads, trails, firebreaks;
- Facilitate holistic reserve planning and zonation; and
- Support conservation management decisions and prioritisation of management actions.

At the regional scale, sensitivity mapping also allows for direct comparison of sites both within and between protected areas to support organisational planning across CapeNature's protected areas network. The process elevates:

- 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 greater environmental impacts, and / or increasing construction and maintenance costs;
- Areas where there is a significant environmental risk to infrastructure; and
- Areas that are visually sensitive and need to be protected to preserve the aesthetic quality of the visitor's experience.

Sensitivity analysis provides decision support to ensure that the location, nature and required mitigation for access, utilisation and infrastructure development in the Langeberg Complex are guided by the best possible landscape-level biodiversity and heritage informants. The process is transparent, relying on defensible expert-derived information and scientific data. Sensitivity maps do not replace site-level investigation, although do allow for rapid assessment of known environmental risks, guiding planning to minimise negative impacts.

Sensitivity analysis uses a hierarchical approach. The method uses the premise that if a portion of the landscape is demarcated as highly sensitive in one of the categories considered in analysis then, regardless of the sensitivity in other categories, that portion is elevated as highly sensitive in the overall scoring. The approach thus allocates the highest allocated sensitivity in any of the input categories as the ultimate sensitivity class for that particular portion. As new and improved data become available, these data can be included.

Biodiversity, heritage and physical features are rated on a standard scale of one to five, where one represents 'no' or 'minimal sensitivity' and five indicates 'maximum sensitivity' (see Figure 5.2). Additional features such as visual sensitivity, fire risk and transport costs can be included. Higher scores represent areas that should be avoided for conventional access and infrastructure development, or where a specific strategy is applicable relative to sensitivity. A score of five 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.

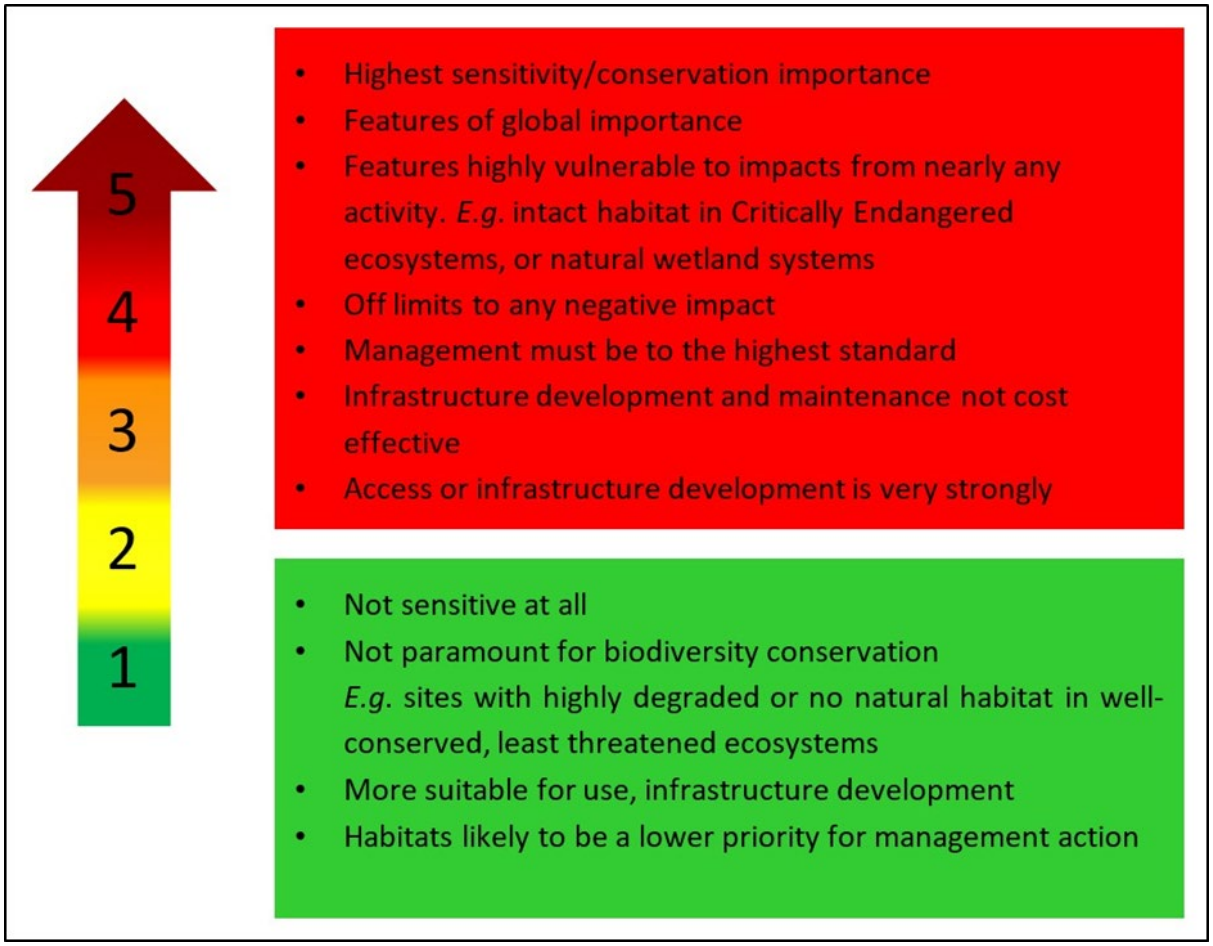

Figure 5.2: CapeNature method for sensitivity scoring and synthesis.

Physical, biodiversity and heritage features included in the sensitivity analysis for the Langeberg Complex is illustrated in Table 5.5 and the sensitivity is shown in Appendix 2, Map 8.

Table 5.5: Physical, biodiversity and heritage sensitivities included in the sensitivity analysis of the Langeberg Complex.

	Category	Dataset	Criteria	Sensitivity score	
Physical	Slope (degrees)	Slope calculated from 20 m 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
			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 based on fine scale vegetation types.	Soils and erosion were assessed by Jan Vlok. Vegetation unit statuses based on Reyers & Vlok (2008) and assessment done by Pool-Stanvliet *et al.* (2017).	Gannaveld, marine dunes and drift sands 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.	Highest sensitivity	**5**
			Aquatic ecosystems (Freshwater streams and seepage areas; Rivers and floodplain) are highly sensitive to erosion, but are adapted to periodic flooding. Other biomes listed as highly sensitive; fynbos dunes mosaic with forests and thickets, mountain fynbos mosaic with waboomveld, and renosterveld mosaic with asbosveld.	High sensitivity	4
			Ericaceous, Mesic Proteoid, Waboomveld, Renosterveld mesic mosaic with grassy fynbos, Renosterveld mesic mosaic with thicket, Renosterveld mosaic with arid fynbos and waboomveld, and Quartz Gannaveld habitat types are more densely	Moderate sensitivity	3

	Category	Dataset	Criteria	Sensitivity score	
			vegetated and/or quite stony to assist with soil retention.		
			Forests, Arid Proteoid, Grassy fynbos, Thicket and Forest mosaic, Waboomveld mosaic and Dune Thicket habitat types usually have dense root systems and good vegetation cover to retain soil.	Low sensitivity	2
			Sandolien, Restioid, Marine Littoral, Thicket Arid Renosterveld mosaics, Thicket mosaics 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
Biodiversity	Rivers	1: 50 000 NGI Rivers	Within 200 m of perennial river	Highest sensitivity	5
			Within 100 m of non-perennial river	High sensitivity	4
	Wetlands and Seeps	NFEPA wetlands (Nel & Driver 2012) and Seeps	Wetland and seeps, only the "natural" wetlands" ("artificial" removed).	Highest sensitivity	5
			Within 200 m of wetlands and seeps	High sensitivity	4
	Vegetation status / Ecosystems threat status	Ecosystem Threat Status based on Cape's 2014 or 2016 assessments per vegetation type (Mucina & Rutherford 2006)	Critically Endangered – Cape lowland Alluvial Vegetation, Eastern Ruens Shale Renosterveld.	Highest sensitivity	5
			Endangered – Breede Alluvium Renosterveld, Garden Route Shale Fynbos, Mossel Bay Shale Renosterveld, Swellendam Silcrete Fynbos.	High sensitivity	4
			Vulnerable – Albertinia Sand Fynbos, Montagu Shale Renosterveld.	Moderate sensitivity	3
			Least threatened – Blombos Strandveld, Breede Shale Fynbos, Canca Limestone Fynbos, Central Coastal Shale Band Vegetation, Little Karoo Quartz Vygieveld, Montagu Shale Fynbos, North Langeberg Sandstone Fynbos, Robertson Granite Fynbos, South Langeberg Sandstone Fynbos, Southern Afrotemperate Forest, Western Little Karoo, Western Cape Afrotemperate Forests.	Lowest sensitivity	1
	Fine-scale vegetation unit statuses	Soils and erosion was assessed by Jan Vlok. Vegetation unit statuses based on Reyers & Vlok (2008)	Critically endangered – Grassy Fynbos, North central perennial stream, Warmwaterberg Fynbos arid Restioid, Mesic Proteoid, Renosterveld mesic Renosterveld	Highest sensitivity	**5**
			Endangered – North western perennial stream, Grassy fynbos-Renosterveld, Doornkloof Gannaveld,	High sensitivity	4

	Category	Dataset	Criteria	Sensitivity score	
		and assessment done by Pool-Stanvliet *et al*. (2017).	Vulnerable – Thicket-Forest Grassy Fynbos, Thicket-Renosterveld, Breederivier perennial stream, Primary Dune, Goukourivier & Gondwana river and floodplain.	Moderate sensitivity	3
			Threatened – None	Low sensitivity	2
			Least threatened – Gwarrieveld, Barrydale & Langeberg Arid Restioid, Arid Proteoid, Drift Sands, Forest thicket Fynbos mosaic, Dune Thicket, Ericaceous, Forests, Koeniekuils Gannaveld, Grootberg & Warmwaterberg Grassy Fynbos, Littoral Vegetation, Langeberg Fynbos Mesic Proteoid, Montane Ericaceous, Montane Mesic Proteoid and -Mosaic Waboomveld, Asbosveld-Renosterveld, Goukou and Cloetesberg and Duyvenhoksrivier and eastern Langeberg perennial stream, Quartz Gannaveld, Restioid, Groot and Touws river and floodplain, Sandolien, Waboomveld.	Lowest sensitivity	1
	Grazing / browsing sensitivity	Soils and erosion was assessed by Jan Vlok. Vegetation unit statuses based on Reyers & Vlok (2008) and assessment done by Pool-Stanvliet *et al*. (2017).	Rivers and floodplains.	Highest sensitivity	**5**
			Gannaveld, Mesic Mosaic Grassy Fynbos, Quartz Gannaveld.	High sensitivity	4
			Arid Mosaic Succulent Karoo, Thicket-Forest Grassy Fynbos, Thicket-Renosterveld, Mesic Renosterveld, Mosaic Asbosveld, Mosaic Waboomveld, Quarts Asbosveld, Waboomveld, Waboomveld Mosaic Thicket.	Moderate sensitivity	3
			Arid Mosaic Renosterveld, Dune-Forest-Thicket-Fynbos, Grassy Fynbos, Montane Mesic Proteoid Mosaic Waboomveld, Perennial stream, Sandolien.	Low sensitivity	2
			Arid Proteoid and - Restioid, Drift Sands, Ericaceous, Forest, Littoral Vegetation, Mesic Proteoid, Montane Ericaceous, Montane Mesic Proteoid, Primary dune, Restioid,	Lowest sensitivity	1
	Rare and endangered plant species	Rare and endangered plant species extracted from CapeNature Biodiversity Data Base, All threatened Species (SANBI 2015)	All plant species rated as Critically Endangered, Endangered, Near Threatened, Rare or Vulnerable. Point localities buffered by 5 m.	Highest sensitivity	5

	Category	Dataset	Criteria	Sensitivity score	
	Special habitat areas	Ecosystem Threat Status based on Cape's 2014 or 2016 assessments per veg type (Mucina & Rutherford 2006)	Afrotemperate forest areas sensitive due to fragmentation, high fire frequency and the very long time period required to reach climax sere. This can also be related to invasive alien plant fuelloads adjacent to (ie in ecotonal areas)and in disturbed sites within these habitats Extracted Southern Afrotemperate Forest and Western Cape Afrotemperate Forests vegetation types.	Highest sensitivity	5
Heritage	Archaeological and cultural sites	Cultural and Heritage Sites (CapeNature Infrastructure register)	Heritage sites as listed in the reserve's infrastructure register. Includes archaeological sites from topo maps 1:50,000. Buffered by 100 m.	Highest sensitivity	5

Approximately 88% of the Langeberg Complex has a high sensitivity (Table 5.6), with key drivers of sensitivity being slope, rivers and wetlands.

Geelkrans Nature Reserve Cluster obtained the highest sensitivity score (with 92.7% of the reserve having a score of 5) due to the high soil erodibility of this coastal dune system. Due to the steep topography of the mountainous sections, the sensitivity has been scored as moderate to very high for approximately 81% of the Langeberg Complex. Sensitivity in the Grootvadersbosch and Marloth Nature Reserve Clusters were elevated due to the presence of a large network of rivers, streams and wetlands.

The vegetation of the Langeberg Complex was not a key driver of sensitivity. The sensitivity based on ecosystem threat status per vegetation type resulted in the Complex being scored as low sensitivity (96.5%). Similarly, when considering the fine-scale vegetation unit status based on Reyers and Vlok (2008) and assessment done by Pool-Stanvliet *et al*. (2017), 87.8% of the Complex have low sensitivity.

Table 5.6: Sensitivity scores for the Langeberg Complex.

Sensitivity Score	Area (ha)	Area (% of total)
1 = lowest sensitivity	6.6	0.0
2 = low sensitivity	353.0	0.7
3 = moderate sensitivity	5 747.5	11.7
4 = high sensitivity	18 442.5	37.6
5 = highest sensitivity	24 518.9	50.0

6 ZONING PLAN

This section outlines the zoning plan for the Langeberg Complex. The Complex forms part of a planning matrix and locating the Complex in terms of the municipal IDP is aimed at minimising conflicting development in either the protected area or the neighbouring municipal area.

The primary objective of the zoning plan is to establish a coherent spatial framework within and around the Langeberg Complex to guide and co-ordinate conservation, tourism and visitor experience, access and utilisation, and stakeholder and neighbour relations.

Zoning is intended to minimise user conflict by separating potentially conflicting activities such as wildlife viewing, recreational activities and tourism accommodation, whilst ensuring that activities and utilisation continues in appropriate areas and do not conflict with the goals and objectives of the Langeberg Complex.

6.1 The Langeberg Complex in the Context of Municipal Integrated Development Planning

The Langeberg Complex encompasses three district municipalities, namely the Cape Winelands, Overberg and Garden Route District Municipalities, and within these three local municipalities, namely Langeberg, Swellendam and Hessequa Municipalities respectively. IDPs are compiled annually and for five year periods by all municipalities in South Africa in order to establish prioritization and allocation of budget expenditure in terms of development priorities.

SDFs are compiled in order to illustrate current and desired future land uses spatially across the municipality and link in to the IDP in terms of the spatial allocation of the municipal budget. As such, there are six IDPs and six SDFs which need to be taken into consideration for the Langeberg Complex, in terms of alignment between statutory initiatives at the three tiers of government and management of the nature reserves and identification of risks and interventions required. The IDP and SDF should be taken into consideration in determining the zone of influence and establishing potential threats and opportunities in these areas. There is also the opportunity to identify projects and interventions that need to be included in the IDPs and SDFs where appropriate and within the legislated stakeholder engagement processes.

6.1.1 Cape Winelands District Municipality IDP and SDF

The Cape Winelands District Municipality IDP includes the Sustainable Development Goals as a basis for its strategy. Environmental concerns identified include over-utilisation of water, water quality, soil erosion and loss of biodiversity and natural beauty.

In terms of projects and programmes across the municipality, the health and air quality programme focuses on environmental education and urban greening. Disaster management is of high relevance for the Langeberg Complex, in particular the fire-fighting services, which forms a separate programme. Reference is made to the Council for Scientific and Industrial Research (CSIR) Veld Fire Risk Assessment, as well as the Fire and Rescue Training Academy, co-ordinated planning for the fire season (including CapeNature) and the FPA.

There are several natural resource management programmes which include water conservation and biodiversity. Those which are relevant to the Langeberg Complex include the Dassieshoek Local Authority Nature Reserve Working for Water project, which is within the MCA. The other projects are not in the vicinity of the Complex. The projects also relate to the District Municipality Climate Change Adaptation Strategy. The tourism programme does not include any nature-based tourism which would

benefit CapeNature. In this IDP the WCBSP is not listed. The only sector plans listed for environmental planning is the Draft Environmental Management Framework (EMF) for a section of the Cape Winelands District Municipality, the Cape Winelands Strategic Environmental Assessment, and the Cape Winelands Biosphere Reserve SDF Plan (which does not include any part of the Langeberg Complex) (Cape Winelands District Municipality 2019a).

The Cape Winelands SDF has included the WCBSP, compiled by CapeNature, to indicate biodiversity features and priorities and thus informs proposed plans for areas surrounding the Langeberg Complex and to determine buffers and the zone of influence. However, the SDF has not included a map of spatial planning categories, which is the overall category taking into consideration all sectors, including biodiversity (Cape Winelands District Municipality 2019b).

6.1.1.1 Langeberg Municipality IDP and SDF

The IDP for this local municipality falls within the framework of the district municipality. In terms of the environmental control and nature conservation, the focus includes maintenance and upgrading of the local authority nature reserves/areas and development of management plans, which includes Montagu Mountain Nature Reserve and Dassieshoek Nature Reserve. Also proposed is a protection plan for indigenous vegetation. A challenge listed is nature conservation capacity (Langeberg Municipality 2018).

The SDF includes an area outside of Montagu bordering on to Twistniet Nature Reserve to the north (Goudmyn, Little Bean and Galenia) designated as a “Special Planning Area” for the development of a contemporary rural village. This could impact on the nature reserve (CNdV Africa 2015).

The SDF for the Langeberg Municipality pre-dates the WCBSP and therefore it was not used as the biodiversity informant. It appears that the Western Cape Biodiversity Framework (2010) was used and that the spatial planning categories followed the appropriate classification. MCAs are included as protected areas.

6.1.2 Overberg District Municipality IDP and SDF

In response to climate change adaption, the Overberg District Municipality is implementing the following actions that could relate to the Langeberg Complex: alien vegetation removal on municipal properties, promotion of wetland conservation, coastal management in terms of the coastal management plan, municipal fire services and a disaster management plan. In terms of environmental management, the primary informant for biodiversity is the WCBSP. The municipality has an Alien Invasive Species Monitoring, Control and Eradication Plan in accordance with the DEA guidelines, with the implementation according to the municipal budget process. The district municipality was one of 11 in South Africa participating in the Local Action for Biodiversity: Wetlands South Africa project. There are important wetlands within the Langeberg Complex and the zone of influence that will benefit from this programme. Challenges identified for the environmental management section include the relevant mandate and adequate budget to fulfil their duties.

None of the major development projects in the IDP will impact on the Langeberg Complex. However, The National Wind and Solar Photovoltaic Energy Strategic

Environmental Assessment identified renewable energy development zones throughout the country, one of which is in the Overberg. This is restricted to the lowlands and is unlikely to affect the Complex, including the birds and bat populations, with the nearest renewable energy development zone boundary just south of the N2 at Swellendam. This could affect corridors linking the Complex to lowland areas, such as the corridor along the Breede River (Overberg District Municipality 2017).

The SDF pre-dates the WCBSP and therefore has not included it, however it has included the Western Cape Biodiversity Framework. The SPCs have not however followed the recommended categorisation of CBAs as Core 2, which have instead been classified as Buffer, although in other sections the CBA is classified as Core 1c, with Core 1b consisting of private nature reserves and conservancies. MCAs have however been accurately depicted as protected area (Overberg District Municipality 2014).

6.1.2.1 Swellendam Municipality IDP and SDF

The IDP for this local municipality falls within the framework of the district municipality. The tourism strategy is generic with no proposals specific to the Langeberg Complex. Although not specifically referred to, water supply is from dams in the area, and it does not refer to groundwater as an important source. The Langeberg Mountains would be an important catchment, for all the dams supplying the municipality. In terms of climate change adaptation, the district municipality IDP is referred to. The disaster management section is generic. The only environmental project that is of relevance to the Complex is the alien invasive management plan. In terms of sector plans and policies, an EMF is proposed (Swellendam Municipality 2017).

The Swellendam SDF also pre-dates the WCBSP and uses the Western Cape Biodiversity Framework and associated categories. The SDF has classified the spatial planning categories according to the relevant category in the Western Cape Biodiversity Framework as was relevant at the time, and fairly detailed and accurate specifications are provided for the spatial planning categories. The SDF identifies Marloth Nature Reserve as a tourism destination (Swellendam Municipality 2015).

6.1.3 Garden Route District Municipality IDP and SDF

The natural environment is identified as the primary tourism attraction, with opportunities in estuarine and marine health, the GCBR and public access to natural areas, with threats including aliens and fires. One of the opportunities identified for tourism is the Still Bay Harbour, which could impact on the Goukou Estuary. None of the identified bulk infrastructure projects for the district municipality will affect the Langeberg Complex.

Environmental management projects identified in the IDP that are of relevance to the Langeberg Complex include the coastal management plan, the EMF, NEM: BA Alien Invasive Plant Management Plans support, and the International Council for Local Environmental Initiatives (ICLEI) partnership programme for wetlands (Eden District Municipality 2018).

The Garden Route SDF does describe the WCBSP and has included maps indicating the plan, but it does not include spatial planning categories. A composite map has been produced which does indicate CBAs and has mapped the Langeberg Complex

under the category “CapeNature Protection and Conservation Areas”, which also encompasses the national parks, MCAs and conservancies. However, in subsequent maps the conservation areas are listed as buffer zones. This raises concern and should be addressed when updating the SDF. In addition, the WCBSP is not mentioned with regards to sector alignment, even although it is the sector plan for biodiversity (Eden District Municipality 2017).

The SDF includes an environmental risk map with both fire and flood risks. The Langeberg Mountain Range is classified as medium to high fire risk, with the section to the northeast of Riversdale encompassing Spioenkop, Tygerberg and Paardeberg classified as very high fire risk. The coastal areas around Still Bay are classified as medium to low fire risk (Eden District Municipality 2017).

6.1.3.1 Hessequa Municipality IDP and SDF

The IDP for the Hessequa Municipality falls within the framework of the district municipality. The disaster management plan and framework is outlined. As for the district municipality IDP, Still Bay Harbour development is identified as a key project. The coastal management programme for the district is compiled in terms of the Integrated Coastal Management Act, 2008 (Act No. 24 of 2008), however the coastal development setback line has not yet been finalised. The Working for the Coast/CoastCare Programme can assist the nature reserve complex. The local municipality climate change adaptation strategy is aligned to the district municipality. There is a Hessequa Municipality Environmental Policy and an environmental education policy (Hessequa Municipality 2018).

The Hessequa Municipality SDF does not include spatial plans for the municipality. The document refers to projects in the IDP. Plans are provided for each of the settlements. There is development proposed in the section between the Geelkrans Nature Reserve and the coastline with the proposal that all of this area will be developed. This includes low – medium density residential, resort and service industry. Of particular concern is the section south of the access road which is included within this management plan as part of the Geelkrans Nature Reserve, which is listed as low – medium density residential. This should be highlighted as high risk for the Geelkrans Nature Reserve (Hessequa Municipality 2017).

Table 6.1 lists the aspects of the Integrated Municipal Development Plans applicable to the Langeberg Complex.

Table 6.1: Aspects of Integrated Municipal Development Plan applicable to the Langeberg Complex.

Municipality	Aspect in IDP to be Addressed	Proposed Intervention
Cape Winelands IDP	Various fire management interventions and structures.	• Integrate with CapeNature operations
Langeberg IDP	Montagu Mountain Local Authority Nature Reserve adjacent to Twistniet – alien clearing, hiking trails etc.	• Take cognisance

Langeberg IDP	"Special Planning Area" for the development of a contemporary rural village to the north Twistniet (Goudmyn, Little Bean and Galenia).	• Need to highlight this as risk, due to impacts such as access, livestock grazing and informal settlements
Overberg IDP	Various fire management interventions and structures.	• Integrate with CapeNature operations
Garden Route IDP	Various fire management interventions and structures.	• Integrate with CapeNature operations
Garden Route & Hessequa IDP	Planned Still Bay Harbour development – could impact on the Goukou Estuary and the Marine Protected Area.	• Identify as a risk
Hessequa IDP	Lappiesbaai Management Plan regarding the dune management at the eastern section of the mouth of the Goukou Estuary.	• Could affect both the Goukou Estuary and the Geelkrans Nature Reserve. • Should be taken into account.
Hessequa IDP	Compilation of the Pauline Bohnen Local Authority Nature Reserve PAMP.	• Adjacent to Geelkrans Nature Reserve, therefore there should be correlation between the two management plans.
Hessequa SDF	Planned residential and tourism development between Geelkrans Nature Reserve and the coast, including sections within the nature reserve.	• Identify as a high risk. • Engage with the Hessequa Municipality.

6.2 Protected Area Zonation

The primary function of the Langeberg Complex is to conserve biodiversity. However, other functions such as ensuring access and providing benefits to neighbouring communities and local economies may conflict with this primary function.

The zonation plan is thus a standard framework and set of formal guidelines to balance conservation, access and utilisation within the Langeberg Complex, and is informed by sensitivity analysis. Zonation:

- Is foundational to planning and development within the Complex;
- Provides a framework for development of the Complex;
- Recognises the purpose for which the Complex is established;
- Ensures ecosystem resilience by limiting human intrusion in the landscape;
- Mitigates user conflict and minimises the impact of utilisation on natural and cultural heritage through access and activity management;
- Accommodates a range of activities ensuring that nature based recreation and experiences for solitude do not conflict with social and environmental requirements or needs; and
- Confines development within the Complex to areas deemed appropriate to tolerate transformation without detracting from sense of place.

CapeNature's zonation categories, illustrated in Table 6.2, are derived from existing protected area zonation schemes worldwide, to develop a coherent scheme that provides for visitor experiences, access and conservation management needs.

Table 6.2: Guide to CapeNature conservation management zones.

Zonation Category	Explanation
Wilderness / Wilderness	Areas with pristine landscape. Includes area with sensitive or threatened habitats. Very limited access.
Primitive	Areas providing natural landscape in solitude with limited access. Normally a buffer area to wilderness zones.
Nature Access	Providing easy access to natural landscape. Includes areas such as roads and trails, and popular viewing sites and sites of interest.
Development – Low intensity	Area with existing degraded footprint. Providing primarily self-catering accommodation and camping, environmental education facilities.
Development – High intensity	Area generally extensively degraded. Providing low and/or higher density accommodation, and maybe some conveniences such as shops and restaurants.
Development – Management	Location of infrastructure and facilities for Reserve Administration.
Development - Production	Commercial or subsistence farming (only applicable if privately owned and managed as contract nature reserve).
Development – Private Areas	Private dwelling and surrounds (only applicable if privately owned and managed as contract nature reserve).
Species / Habitat / Cultural Protections	Protection zone – Protection of species or habitats of special conservation concern.
Cultural Species / Habitat Visual Natural Resource Access	Special management overlays provide an indication of areas requiring special management intervention within the above zone.
Marine Protected Area – Controlled zone	Marine Protected Area areas formally declared to protect and conserve the marine environment and resources. The controlled zone means an area where permitted fishing is allowed.
Marine Protected Area – Restricted zone	Marine Protected Area areas formally declared to protect and conserve the marine environment and resources. In the restricted zone no fishing is allowed.

The following underlying decision-making rules are applied in determining zones:

1. Strike a balance between environmental protection and development of the Complex to meet broader economic and social objectives of the protected area.
2. Consider existing development footprints and tourism access routes based on:

- The principle that all else being equal, an existing transformed site is preferable to a green fields site from a biodiversity perspective;
- Increasing costs, the further developments are from existing infrastructure;
- The socio-economic benefit of existing tourism nodes and access routes; and
- Infrastructure design and services with due consideration for focal values.

3. Where existing development nodes, tourist sites and access routes occur in areas with high sensitivity-value, associated zonation must aim to confine the development footprint as much as possible and preferably within the existing transformed site.

4. Sites with high biodiversity sensitivity value are put into stronger protection zones and peripheral development is favoured.

A summary of the zonation scheme applicable to the Langeberg Complex is depicted in Table 6.3 and illustrated in Appendix 2, Map 9.

Table 6.3: Summary of CapeNature zonation categories applicable to the Langeberg Complex.

Zonation Category	Distribution within the Langeberg Complex
Wilderness / Wilderness	The mountainous area of Marloth Nature Reserve between the northern mountain crest and southern mountain crests, if visible, was zoned wilderness. The entire Boosmansbos Wilderness Area is a declared wilderness area and was zoned as such. The entire Paardeberg Nature Reserve was zoned wilderness due to its sensitive habitat for threatened beetles.
Primitive	All the protected areas in the Langeberg Complex were zoned primitive except for the areas zoned for wilderness (part of Marloth, Boosmansbos and Paardeberg), species habitat (Kruis Rivier Wetland Nature Reserve and a small area in Grootvadersbosch Nature Reserve), development and nature access.
Nature Access	For all the reserves within the Langeberg Complex the following public roads with unrestricted access were buffered by 25 m and zoned as nature access, except for areas zoned development; • Jeep track between farms running across Twistniet Nature Reserve. • Nooitgedacht jeep track at Marloth Nature Reserve. • The Ring road at Grootvadersbosch Nature Reserve. • Garcia pass. • All jeep tracks crossing Geelkrans, Still Bay Oos, Blomboschfontein 2 and Kleinjongensfontein Nature Reserves. The Crystals kloof trail at Garcia Nature Reserve was buffered by 2.5 m and zoned as nature access due to unrestricted access and high usage.
Development – Low intensity	Marloth Nature Reserve – the original forest station area where there are tourism accommodation and reserve offices. Grootvadersbosch Nature Reserve – Two areas, one near the office area with campsites and Scolopia, and one at new tourism cabins.
Development –	Thornhill (Doornkloof) Nature Reserve – Area developed by

Zonation Category	Distribution within the Langeberg Complex
Management	previous landowner, which are still being maintained and the servitude around the dam. Grootvadersbosch Nature Reserve – Area around the office and staff complex. Blomboschfontein Nature Reserve – The whole area used by management. Geelkrans Nature Reserve / Still Bay – servitude area at reservoir. Blomboschfontein Nature Reserve – A 25 m buffer of the road for which a Memorandum of Understanding was signed between CapeNature and the landowner.
Species / Habitat / Cultural Protections	Grootvadersbosch Nature Reserve – Special habitat area delineated for butterflies, dwarf chameleon, redwoods. Kruis River Wetland Nature Reserve – The entire declared wetland nature reserve.
Marine Protected Area – Restricted zone	Stilbaai Marine Protected Area - Goukou estuary - upper, Skulpiesbaai and Geelkrans
Marine Protected Area – Controlled zone	Stilbaai Marine Protected Area – Still Bay and Goukou estuary - lower.

6.3 Protected Area Zone of Influence

CapeNature seeks to maximise positive influences and / or minimise direct and indirect negative pressures on values, with the aim of ensuring the persistence of species and biodiversity in general. Activities managed include those that might have direct impacts on values, and those that have only indirect effects, often at considerable distance from the location where the activity takes place.

The zone of influence is a mechanism that recognises, and activates the abovementioned principle. Three key informants (Figure 6.1) used to delineate the zone include:

- Viability of focal values;
- Threats assessment; and
- Protected area sensitivity and zonation.

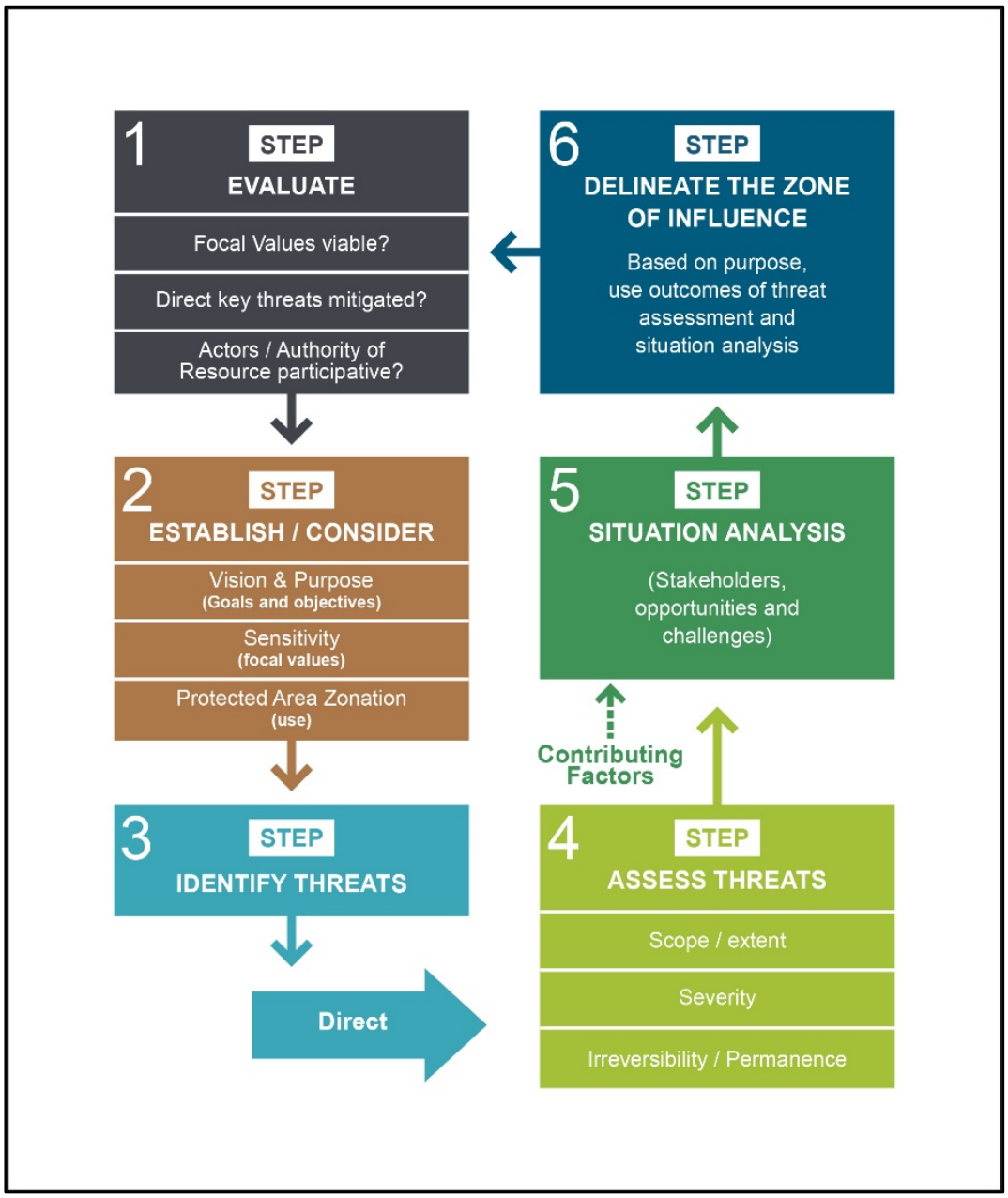

Figure 6.1: Process flow for the delineation of the zone of influence.

The zone of influence is a non-legislated area spatially depicted around the Langeberg Complex. The zone ultimately aims to facilitate strategic stakeholder engagement by linking key stakeholders to prioritised influences to promote an ecologically functional landscape that supports goals and objectives of the Complex, and enhances the benefits derived from the Complex. The process of delineation helps to identify:

1) Actions to directly restore a value or mitigate a threat;
2) Actions designed for people to continue positive behaviours or halt direct threats; and/or
3) Actions to address enabling conditions.

The zone of influence is thus:

- A tool to guide resource allocation and investment outside of the Complex;

- A tool to marry stakeholder engagement / authorities of resource to activities;
- A spatial prioritisation of where to support compatible land and water use, and positive behaviours;
- A spatial prioritisation of where to collaborate and with whom;
- A mechanism to prioritise support to landowners or managers of priority landscapes; and
- All-encompassing mechanism that includes all or part of a buffer zone as prescribed in terms of legislative frameworks and conventions.

The spatial features used in the zone of influence calculation are rated on a standard scale of one to four: Low (1), Medium (2), High (3), and Very high (4). These ratings are assigned to each input feature within the zone of influence. Higher scores represent areas where many features overlap, elevating the necessity to engage stakeholders and positively influence neighbour relations and / or activities.

Table 6.4 lists the features, criteria and rating applied to delineate the zone of influence of the Langeberg Complex. Appendix 2 Map 10 illustrates the zone of influence for the Complex.

Table 6.4: The criteria used for defining the zone of influence of the Langeberg Complex.

Feature	Criteria	Rating	Zone area (ha)	% of zone
Over abstraction of water (surface and groundwater)	Water abstraction from water recharge area of freshwater ecosystem - Agricultural fields with irrigation.	Very high (4)	5 343.4	1.6
Illegal fishing and harvesting of marine resources	Illegal fishing activities within the Marine Protected Area.	Very high (4)	3 307.5	1.0
Invasive alien plants	Plantations and stands of invasive alien plants adjacent to the protected areas.	High (3)	68 130.8	20.5
Urban, commercial and industrial developments	Expansion of urban areas, and commercial and industrial developments near protected areas - buffer towns by 1500 m.	High (3)	3 981.0	1.2
Water pollution from agriculture activities	Pollution of rivers from agricultural and industrial activities – 50 m buffer of rivers.	High (3)	2 683.0	0.8
Fire hazards (high fire frequency)	Inappropriate fire regime due to anthropogenic fires. Based on flammability of vegetation with areas identified as hotspots for anthropogenic fires	High (3)	11 256.8	3.4
Invasive alien fish	Fish monitoring areas identified due to presence of threatened species - rivers buffered by 32 m.	Medium (2)	680.6	0.2

Feature	Criteria	Rating	Zone area (ha)	% of zone
Viewshed analyses	Viewshed analyses from critical viewpoints and accommodation to protect “sense of place”.	Medium (2)	7 483.5	2.3
Illegal resource use	Poaching of fauna and flora; livestock grazing.	Low (1)	32 408.3	9.8
Illegal recreation	Illegal access for recreational purposes.	Low (1)	1 543.3	0.5
Game farming	Game farms adjacent to protected area where introduction of extra-limited game species, or fencing that limits the movement of wild animals, have influence.	Low (1)	86 141.9	25.9
Mountain Catchment areas	Declared Mountain Catchment Areas.	Low (1)	69 715.4	21.0
Local Authority Nature Reserves	Proclaimed Contract Nature Reserves (Pauline Bohnen & Skulpiesbaai); Montagu Mountain and Montagu Eeufees.	Low (1)	1 202.7	0.4
Stewardship Sites - Signed and designated	Stewardship sites that have direct land- and/or water management responsibilities and that contribute to Protected Area values and appropriate Protected Area design in terms of connectivity and extent.	Low (1)	5 345.7	1.6
Protected Area Expansion Strategy	Areas identified for the protected areas expansion strategy, but not yet signed and designated.	Low (1)	18 487.6	5.6
Goukou Estuary	Part of the Stilbaai Marine Protected Area. Monitoring of ecological health of estuaries and monitoring impacts from various threats.	Low (1)	372.3	0.1
Coastal areas and marine protected areas.	Marine Protected Areas have a direct aquatic fauna and coastal ecosystems management responsibility and contributes to the overall Protected Area value and design.	Low (1)	3 307.5	1.0
Areas identified through special projects	The Western Cape Biodiversity Spatial Plan was used to delineate the zone falling adjacent to the Thornhill (Doornkloof) Nature Reserve.	Low (1)	1 385.0	0.4
Coastal Corridor	Coastal corridor delineated for areas with sensitive vegetation types and where a high threat of development exists.	Low (1)	8 720.7	2.6

Feature	Criteria	Rating	Zone area (ha)	% of zone
Other corridors	Corridor for fauna movement along Goukou river.	Low (1)	25 853.0	7.8

The zone of influence for the Langeberg Complex has a total extent of 332 356.31 ha.

Approximately 2.6 % of the zone of influence is impacted by abstraction of water and illegal fishing and harvesting of marine resources (Table 6.4). Over abstraction of surface and ground water has a high impact on the water recharge areas, extensive wetland areas such as the Kruis Rivier Wetland Nature Reserve, and the Goukou estuary. Illegal fishing and harvesting of marine resources mainly affects the Stilbaai MPA and the Goukou estuary.

Factors such as stands of invasive alien plants bordering the protected areas (source of re-infestation), urban expansion and industrial developments, water pollution from agricultural activities and an inappropriate fire regime due to anthropogenic fires affected 26 % of the zone of influence of the Langeberg Complex. Invasive alien plants and inappropriate fire regime were mainly an issue in the MCA, while urban expansion centered on Still Bay and Kleinjongensfontein. Water pollution occurs mainly along the Kruisrivier and its tributaries at low levels. The biggest concern relating to water pollution is along the Goukou River and estuary.

7 ACCESS AND FACILITIES

This section describes infrastructure and procedures necessary for management of the Langeberg Complex, inclusive of operations and visitors. It provides information on access facilities, operational facilities, control measures as well as commercial and community use.

7.1 Public Access and Management

The main access to Marloth Nature Reserve is at the office complex where the visitors may enter through a controlled gate. Entry fees are applicable. This entrance provides access to all the visitor facilities. A number of other access points are only accessible by management as it mostly crosses private land. These provide access to firebreaks, footpaths, hiking huts and for fires fighting or other emergencies. Gates are installed in order to prevent illegal access. However, the most of the reserve is not fenced and people can enter on foot.

Grootvadersbosch Nature Reserve has only one main entrance at the office complex. All visitors to the reserve enter through this gate and an entry - conservation fee is also applicable. The reserve is mostly not fenced and can be entered at different points, but borders onto private farms where entry is restricted. An additional entry point exists in Garcia Pass where hikers can enter the Sleeping Beauty and Klein Phisantefontein/Kristalkloof hiking trails. Several other entry points are available for management to get access to the reserve. To access these points, private farms have to be crossed that provide some protection against illegal entry.

Grootvadersbosch Nature Reserve is crossed by public roads (Garcia, Tradouw and Gysmanshoek passes) that is not fenced. People can therefore enter illegally, which provides challenges in terms of illegal flora harvesting and wild fires.

Geelkrans Nature Reserve has one currently unmanned public access point near the manager's house. This provides access to a day trail and a self-issue permit system is implemented. Other access points for management purposes exist including a servitude right for the Hessequa municipality to access a municipal water storage facility on the reserve.

A public footpath (servitude) exists across Blomboschfontein reserve to provide access to the Blombos beach for the general public. Private landowners adjacent to the reserve also use this path to access their dwellings with vehicles. Access is controlled by a locked gate.

Two vehicle tracks cross the Kleinjongensfontein reserve to provide access to adjacent private properties. Gates are also locked.

The Stilbaai MPA can be accessed from numerous points as it is surrounded by the town of Stilbaai and a number of small farms including lifestyle farms and recreational developments. The main access points are the Stilbaai harbour and three municipal slipways for small vessels. Numerous private slipways and jetties exist in the estuary that is part of the MPA.

Public access points to the Langeberg Complex are listed in Table 7.1 and illustrated in Appendix 2 Map 11.

Table 7.1: Managed public access points to the Langeberg Complex.

Locality	Name	Type of Access	Activity
Erf 74/495 Blomboschfontein Residents	Blomboschfontein (Erven)	Controlled Access	Management
Blomboschfontein Nature Reserve Signage	Blomboschfontein Nature Reserve	Uncontrolled Access	Tourism (Public coastal access point/Access to the beach and private dwellings)
Blomboschfontein Nature Reserve Signage	Blomboschfontein Nature Reserve	Controlled Access	Management (Access to Western sector of Reserve)
Blomboschfontein Nature Reserve Signage	Blomboschfontein Nature Reserve	Controlled Access	Management (Access to Eastern sector of reserve)
Southern Access point	Blomboschfontein Nature Reserve	Uncontrolled Access	Management
Public access point	Blomboschfontein Nature Reserve	Uncontrolled Access	Tourism
Blombos Cave Access point	Blomboschfontein Nature Reserve	Uncontrolled Access	Management
Winterdowns farm gate	Blomboschfontein Nature Reserve	Controlled Access	Management

Locality	Name	Type of Access	Activity
Grootvadersbosch Nature Reserve to Loerklip	Boosmansbos Wilderness Area	Controlled Access	Tourism (Start of Wilderness Area, Saagkuilskloof and Barend Koen Hiking Trails)
Main Entrance Gate. Locked Gate. Signage present	Thornhill (Doornkloof) Nature Reserve	Controlled Access	Management
Via MTO Garcia Signage present	Garcia Nature Reserve	Controlled Access	Tourism and Management
Garcia Pass - Public Road: Right of Way (North)	Garcia Nature Reserve	Uncontrolled Access	Right of Way
Garcia Pass – adjacent hiking trails (see 7.3.2)	Garcia Nature Reserve	Uncontrolled Access	Hiking
Garcia Pass - Public Road: Right of Way (South)	Garcia Nature Reserve	Uncontrolled Access	Right of Way
Geelkrans Main Entrance	Geelkrans Nature Reserve	Controlled Access	Tourism
Gate to Neighbouring Property - Bosbokfontein Private Nature Reserve	Geelkrans Nature Reserve	Controlled Access	Management, access to neighbouring property
Hikers access to Neighbouring Property - Bosbokfontein Private Nature Reserve	Geelkrans Nature Reserve	Uncontrolled Access	Tourism (Hiking)
Fire Break Gate.	Geelkrans Nature Reserve	Controlled Access	Management
Start of Uitkyk Road	Geelkrans Nature Reserve	Controlled Access	Management
Informal Beach Access	Geelkrans Nature Reserve	Uncontrolled Access	Tourism (beach walks)
Geelkrans Nature Reserve Signage - Main Reserve Access	Geelkrans Nature Reserve	Controlled Access	Tourism and Management
Uncontrolled Access. No signage	Geelkrans Nature Reserve	Uncontrolled Access	Tourism
Grootvadersbosch Main Entrance Gate	Grootvadersbosch Nature Reserve	Controlled Access	Tourism and Management (Hiking, day walks, bikes and overnighting)
Southern Oosthuizen Exit	Kleinjongensfontein Nature Reserve	Uncontrolled Access	Management
Kleinjongensfontein Main Reserve Access	Kleinjongensfontein Nature Reserve	Uncontrolled Access	Management

Locality	Name	Type of Access	Activity
Southern Exit to 18/494 Farm	Kleinjongensfontein Nature Reserve	Uncontrolled Access	Management
Northern Oosthuizen Access	Kleinjongensfontein Nature Reserve	Uncontrolled Access	Management
Southern Oosthuizen Exit	Kleinjongensfontein Nature Reserve	Controlled Access	Management
Kleinjongensfontein Nature Reserve Signage 1 - Northern access	Kleinjongensfontein Nature Reserve	Controlled Access	Management
Kleinjongensfontein Southern Access	Kleinjongensfontein Nature Reserve	Controlled Access	Management
No Public Access. Management Access through private land, via Broomvlei.	Kruis Rivier Wetlands Nature Reserve	No Public Access	Management
Mardouw Gate	Marloth Nature Reserve	Controlled Access	Management (Access to Mardouw Gate)
Access to Nooitgedacht Gate	Marloth Nature Reserve	Controlled Access	Management (Access to Nooitgedacht Gate)
Management Access to Wolfkloof Gate	Marloth Nature Reserve	Controlled Access	Management (Access to Wolfkloof)
Hermitage Gate	Marloth Nature Reserve	Controlled Access	Management (Access to Hermitage gate)
Marloth Main Entrance Gate	Marloth Nature Reserve	Controlled Access	Tourism and Management (Hiking, day walks, bikes and overnighting)
No Public Access. Management Access through private land, via Blomberg Nature Reserve.	Paardeberg Nature Reserve	No Public Access	Management access through private property.
No Public Access. Management Access through private land, via Waterval (Virgin earth).	Paardeberg Nature Reserve	No Public Access	Management access through private property
No Public Access. Management Access through private land, via Blomberg Nature Reserve.	Spioenkop Nature Reserve	No Public Access	Management access through private property
No Public Access. Management Access through private land, via Langkloof.	Spioenkop Nature Reserve	No Public Access	Management access through private property

Locality	Name	Type of Access	Activity
Reservoir Servitude access	Geelkrans Nature Reserve	Uncontrolled Access	Management to access the servitude
Preekstoel Road: Public Access - Right of Way (West)	Geelkrans Nature Reserve	Uncontrolled Access	Right of Way
Preekstoel Road: Public Access - Right of Way (East)	Geelkrans Nature Reserve	Uncontrolled Access	Right of Way
No Public Access to Twistniet Nature Reserve	Twistniet Nature Reserve	No Public Access	Management
Management and Tourism Access through private land, via Dr Betty Fisher (Witblitz trail). Locked Gate. No Signage.	Tygerberg Nature Reserve	Controlled Access	Tourism and Management
Management and Tourism Access through private land, via Hopefield. Locked Gate. No Signage.	Tygerberg Nature Reserve	Controlled Access	Tourism and Management
No Public Access. Management Access through private land, via Koktyls Nature Reserve.	Warmwaterberg Nature Reserve	No Public Access	Management
No Public Access to Witbosrivier Nature Reserve	Witbosrivier Nature Reserve	No Public Access	Management
No Public Access to Twistniet Nature Reserve	Zuurberg Nature Reserve	No Public Access	Management

Demarcated coastal access points are listed in Table 7.2 and illustrated in Appendix 2 Map 11.

Table 7.2: Demarcated coastal access points within the Langeberg Complex.

Locality	Name	Type of Access	Activity
Stilbaai Marine Protected Area	Lappiesbaai	Vehicular; Pedestrian (from designated parking area)	Beach recreation
Stilbaai Marine Protected Area	Schulpiesbaai	Pedestrian (from designated parking area)	Beach recreation
Stilbaai Marine Protected Area	Estuary	Pedestrian (from designated parking area)	Beach recreation
Stilbaai Marine Protected Area	Main jetty and slipway, Versfeld street	Vehicular, pedestrian	Boat launching, walking

Locality	Name	Type of Access	Activity
Stilbaai Marine Protected Area	Swim jetty Versfeld street	Pedestrian	Swimming, fishing
Stilbaai Marine Protected Area	Slipway. Catamaran	Vehicular	Boat launching
Stilbaai Marine Protected Area	Slipway Main Road	Vehicular	Boat launching
Blomboschfontein Reserve	Blombos footpath	Pedestrian and limited vehicular	Access to dwellings, fishing

7.2 Airfields and Flight Corridors

Section 47 of the NEM: PAA stipulates prescriptions for the use of aircraft in a World Heritage Site. An informal helicopter landing strip exists just outside Marloth Nature Reserve's main gate. This landing strip is only used for emergency purposes such as mountain rescues and firefighting operations. If emergencies occur in the other reserves that necessitate the use of helicopters, emergency landing areas will be allocated where and when landing is safe. No flights without authorisation from the management authority (CapeNature), except emergency and management flights, are allowed in the World Heritage Site.

7.3 Administrative and Other Facilities

The Langeberg Complex is managed from three separate management centres namely Marloth, Grootvadersbosch and Geelkrans Nature Reserves, but incorporated in one landscape unit, the Langeberg landscape. Each management unit has its own management structure, budgets and office complex. The office complex of Marloth Nature Reserve is situated approximately 1.5 km outside the town of Swellendam and the Grootvadersbosch Nature Reserve office complex is situated approximately 21 km from the town of Heidelberg and 22 km from the missionary town of Suurbraak. The Office of Geelkrans Nature Reserve is situated in the town of Still Bay at the municipal buildings.

Infrastructure and associated building maintenance requirements are captured and managed in the protected area infrastructure register. Major infrastructure is illustrated in Appendix 2 Map 12.

The concept development plan, associated zonation scheme and strategic framework guide newly proposed development over the planning period. See Section 9. Focus areas include infrastructure evaluation, environmental scoping and land use advice to define environmentally responsible development options. This includes feasibility studies and costings for proposed restoration and / or replication of heritage structures that can serve the dual purpose of heritage conservation and awareness and operational and tourism management.

7.3.1 Roads / Jeep Tracks

Jeep tracks within the Langeberg Complex are mostly not surfaced and not always accessible by all vehicles. Most of the Complex jeep tracks are utilised for management purposes and for access to demarcated nature access areas. These jeep tracks are accessible by sedan vehicles and are mostly not surfaced with only

paved sections at Grootvadersbosch Nature Reserve. Some jeep tracks are exclusively used for management purposes and are only accessible by 4x4 vehicles.

All roads and tracks need regular maintenance to fill potholes and erosion furrows as well as repairing and clearing drainage furrows and pipes. Some roads might need new layers of gravel or the placing of concrete blocks, paving bricks or *in-situ* casted concrete strips. This is done as part of a maintenance schedule and will include the cutting back of plant material that overgrow the paths. Care should be taken that all material brought into the reserve is clear of invasive alien vegetation seed or that it is regularly checked and cleared from germinating alien invasive vegetation.

The R323 is a public road which includes Garcia Pass and traverses the Garcia Forest (part of the ex Garcia State Forest) and borders the eastern boundary of Thornhill (Doornkloof). The purpose of these roads is access to areas either side of the nature reserve and not for the purposes of the nature reserve itself, such as reserve management and tourist access. CapeNature would not have any responsibility for maintenance, as this road is maintained by the Provincial Department of Transport and Public Works.

7.3.2 Hiking trails

The Swellendam hiking trail in Marloth Nature Reserve is a 5-day trail of 59 km with four overnight huts. The Glenstroom hut close to the office complex may be used for visitor or staff accommodation, but if this is decided and approved, refurbishment is needed. Approximately 32 km of day trails are available for overnight tourist and day visitors. Various routes and distances from easy to strenuous can be hiked.

The Grootvadersbosch Nature Reserve Cluster has a network of approximately 100 km of day and overnight hiking trails providing access for hikers to the remote mountainous areas including the Boosmansbos Wilderness Area (Figure 7.1). Day hiking trails include the Bushbuck trail (10 km) and the Grysbok circle (15 km) situated within the Grootvadersbosch Nature Reserve. The Sleeping Beauty (14.1 km) and Kristalskloof (8.4 km) trails are situated within the Garcia section of the Grootvadersbosch Nature Reserve Cluster.

In the Boosmansbos Wilderness Area has a network of 64 km trails. Since this is a wilderness area, paths are unmarked, with overnight huts providing rudimentary shelter. A maximum of 12 people per day are permitted in the area and hikers may choose their own routes. The popular Wilderness Trail (27 km) is an overnight trail that starts and ends at Grootvadersbosch Nature Reserve Office. A very basic shelter is situated in the wilderness area along this trail.

There is one hiking trail on Geelkrans Nature Reserve of approximately 7.5 km. This circular trail starts at the Preekstoel car park (Stilbaai East) and traverses the coastal section of Geelkrans Nature Reserve. The return leg of the hiking route is situated on the beach.

These trails need regular clearing of overgrowing vegetation, filling of erosion furrows, repairing of steps and drainage furrows and barriers. Maintenance schedules are updated and implemented on an annual basis.

Figure 7.1: Hiking trails in the Grootvadersbosch Nature Reserve. Photo: Ian Allen.

7.3.3 Buildings

Buildings of the Langeberg Complex are designed and utilised for operations and staff accommodation, and maintained as per register. The Concept Development Plan, associated zonation scheme and strategic framework identified existing development footprints and focus areas for management.

Most building infrastructure at Marloth Nature Reserve is centred on the office and staff complex. This include the management office as well as stores and a small workshop, Working on Fire (WoF) base, five staff houses and two tourist accommodation units. Other infrastructure includes six hiking huts along the Swellendam hiking trail, but only four of these huts are in use and maintained.

Grootvadersbosch Nature Reserve's main building infrastructure is centred on the office and staff complex as well as the tourist accommodation site. The office complex consists of the office, information centre, stores, two staff houses, one tourist accommodation unit and a camp site. The main tourist accommodation site is approximately 2 km west of the office complex and consist of 13 tourist accommodation units, a conference hall, a swimming pool and an environmental education facility that can accommodate up to 50 people.

The buildings at Geelkrans Nature Reserve consists of one staff dwelling and a store approximately 2 km east of Still Bay as well as a staff dwelling and a store at

Blomboschfontein, approximately 20 km west of Still Bay. The office is a rented building in the town of Still Bay at the municipal office complex.

7.3.4 Fences

The boundaries of the Marloth Nature Reserve Cluster are mostly unfenced and are only demarcated with packed rock cairns and/or signage. Only the Mardouw area is partially fenced (stock fence) with a gate and signage. The reserve and the privately managed Marloth Forest Estate jointly maintains the boundary fence on the perimeter of the plantation (former State Forest plantation and SAFCOL), in order to minimise illegal access from the surrounding town to the reserve area near the reserve office. The office is fenced with a security fence and gate.

The Grootvadersbosch Nature Reserve Cluster is mostly unfenced but is demarcated with an extensive network of fire breaks as per the original declared catchment boundary. All internal fences have been removed. Boundary fences shared with properties where game has been re-introduced are intact and are being maintained by the relevant landowners. Paardeberg, Witelsbos, Tygerberg and Spioenkop Nature Reserves are located high up in the mountain and are therefore not fenced.

The boundaries of the Geelkrans cluster are mostly fenced. The standard fence is a typical 6 strand livestock fence. The exception is the northern boundary of Blomboschfontein that has a game fence. The southern coastal boundaries of the reserves are all characterised by steep sandstone cliffs. These areas therefore do not require any fencing. The only other area with no fences are the communal boundary between Geelkrans and Pauline Bohnen Local Authority Nature Reserve.

7.3.5 High sites

Currently no registered high sites occur within the Langeberg Complex. The proliferation of intensively developed high sites for cellular or national radio or telecommunications is discouraged. However, in the near future, a high site will have to be identified for the establishment of a reserve radio repeater site at Marloth and or Grootvadersbosch in order to upgrade communications for operational activities in the mountainous terrain of the Complex. No new roads should be built to these planned sites.

7.3.6 Signage

Signage is located at all major entrance points to the Langeberg Complex. Directional and informative signage exist at hiking trails and other visitor facilities. Interpretive signage is also at selected sites and points of interest. Signage inform and display the major rules and regulations to promote legal compliance by all users of the protected areas as well as applicable tariffs, entry times and duty staff contact details.

All signage must conform to the CapeNature brand as per the signage manual and designed and approved by the Communication Section of CapeNature. Signage pollution needs to be avoided and the use of information kiosks and/or centres are encouraged. Indemnity notices are essential at all visitor entry points. The placing of signage should also be done in collaboration with the communications section. Signage is maintained and replaced if it becomes weathered or is vandalised.

7.3.7 Utilities

7.3.7.1 Water supply

The primary water supply to the Marloth Nature Reserve is derived from a borehole and pumped into a reservoir from where it is gravity fed to the different buildings. A water level reading is taken each time water is pumped from this borehole and recorded. At Grootvadersbosch Nature Reserve, water is abstracted from a stream and stored in reservoirs where it is treated and filtered before it is fed to the different buildings both at the tourist and office precincts. Water provision at the Geelkrans Nature Reserve is derived from the municipal water provision network. Rainwater harvesting for operational purposes takes place across the Langeberg Complex.

The dam on Thornhill (Doornkloof) supplies water to the surrounding landowners through the Brandrivier Water Association.

At Blomboschfontein water provisioning from a borehole takes place for farm 74/495. Historical landowner agreements also require CapeNature to provide water to a cement dam for registered farmers. Currently there are only two registered farms.

Water servitudes which provide water from the nature reserve to external recipients are documented in Table 7.3.

7.3.7.2 Electricity supply

Eskom supplies electricity to most the development sites in the Langeberg Complex, but the maintenance of the internal reticulation infrastructure is the responsibility of CapeNature. The electricity to the Geelkrans Nature Reserve and office is supplied by the Hessequa Municipality.

The use of solar energy needs to be encouraged at all buildings in the Langeberg Complex where hot water is needed. The Grootvadersbosch tourist cabins are already fitted with solar heaters for hot water.

7.3.7.3 Waste management

There are no waste disposal sites within the Langeberg Complex. All waste is collected by the reserve staff on a regular basis and transported to the relevant municipal collections sites. Baboon proof rubbish bins have to be used at Marloth and Grootvadersbosch Nature Reserves where the waste cannot be placed inside buildings to discourage baboons, vervet monkeys and other animals to access waste. Visitors to hiking trails are instructed to carry out all waste and dispose of at an identified sites at the reserve office on their return.

A rotating biological contactor sewerage unit (Beacon model BH150) is installed at the Grootvadersbosch tourist precinct, but all other sewerage systems at buildings in the Langeberg Complex comprise tanks with soakaways.

7.3.8 Visitor facilities

Visitor facilities at Marloth Nature Reserve is limited to two accommodation units and the Swellendam hiking trail with four overnight huts. Day trails are also available as described in section 7.3.2.

Grootvadersbosch Nature Reserve has 11 tourist cabins as well as a campsite with 12 sites. Campsites are equipped with electricity points and two sites have private ablution facilities (Figure 7.2). Day trails are available as well as trails in the Wilderness Area described in section 7.3.2.

There are no visitor facilities at Geelkrans.

Figure 7.2: Tourism facilities at Grootvadersbosch Nature Reserve. Photo: Ian Allen.

7.4 Commercial Activities

No commercial activities exist on the reserves in the Langeberg Complex and no agreements or concessions are in place. All tourism activities are managed by CapeNature.

7.5 Community Use

No agreements exist for the use of any resources in the Langeberg Complex. A memorandum of understanding with the Railton Foundation made provision for the use of the Grootvadersbosch Nature Reserve environmental education centre for environmental education, youth leadership, cultural awareness and development. This memorandum expired on 6 February 2019 and at present there is no indication whether this agreement will be renewed.

7.6 Servitudes

A number of servitude agreements exist for the Langeberg Complex where the respective entities are provided access to land managed as part of the Protected Area. Current servitudes are listed in Table 7.3 and mapped in Appendix 2 Map 12.

Conditional access regulated through servitudes includes agreements with neighbouring Landowners/Land Managers for water user-rights, right of way, pipelines and service or access roads.

Table 7.3: Servitudes applicable to the Langeberg Complex.

Date of Agreement	Type of Agreement	Partner	Duration of Agreement (years)	Area Affected	Conditions of use
Pre 2000 (1960s)	User Rights – Borehole. Water usage by Private land Owner	W Lots	Not Specified	Farm 495/74 Blomboschfontein Nature Reserve - Borehole with pump.	Borehole: Water usage by Private land Owner.
1991	Servitude - Reservoir and Cell Tower. Access to Infrastructure.	Hessequa Municipality and Vodacom	Not Specified	Erf 215 Geelkrans Nature Reserve	Not Specified – in perpetuity.
1991	Servitude – Access road to Infrastructure.	Hessequa Municipality and Vodacom	Not Specified	Erf 215 Geelkrans Nature Reserve (Servitude Road)	Not Specified – in perpetuity.
1991	Servitude – Pipeline. Access to Infrastructure.	Hessequa Municipality and Vodacom	Not Specified	Erf 215/0 Geelkrans Nature Reserve.	Not Specified
Pre 2000 (1960s)	User Rights – Road. User access over CapeNature managed land	Private Land owners	Not Specified	FARM 494/0 Kleinjongensfontein Nature Reserve. 2.2 km. Open Gate - Access to reserve for management. Agreement access for property owners 18, 17, 51/494 Kleinjongensfontein.	Road: private land owner's access over CapeNature managed land.
1967	Servitude - Unknown	Unknown	Not Specified	FARM 494/0 Kleinjongensfontein Nature Reserve.	Not Specified – in perpetuity.
1991	Servitude – Pipeline. Access to Infrastructure.	Hessequa Municipality and Vodacom	Not Specified	Erf 216/0 Geelkrans Nature Reserve.	Not Specified – in perpetuity.
Unknown	User Rights – Road. User access over CapeNature managed land.	Public Road Access	Not Specified	ERF 216/0 Geelkrans Nature Reserve. Secondary Road Public Road 0.74 km.	Not Specified

Date of Agreement	Type of Agreement	Partner	Duration of Agreement (years)	Area Affected	Conditions of use
1974	Servitude - Dam Area	Unknown	Not specified	FARM578/0 Thornhill Nature Reserve. Dam Area.	Water provision for the Brandrivier Water Association.
1974	Servitude - Dam Area	Unknown	Not specified	FARM578/0 Thornhill Nature Reserve. Dam Area.	Water provision for the Brandrivier Water Association.
03 April 1867	User Rights - Water	Municipality	In Perpetua	The Farm “Kampsche Berg” No. 72 Riversdale.	Water provision for the Hessequa Municipality.
Unknown	User Rights - Water	Michael Mallet	Unknown	The Farm Karee Kop No. 66 Riversdale	Water provision for the Hessequa Municipality.
Unknown	User Rights - Water	Hermanus Janse van Noordwyk	Unknown	Remainder of Farm Assagaaibosch No. 101 Riversdale.	Corrente-Vetterivier Irrigation Scheme.
Unknown	User Rights - Water	Municipality	In Perpetua	Remainder of the Farm The Camp No. 108 Riversdale	Water provision for the Hessequa Municipality.
Unknown	User Rights - Water	Willem and Frans Geldenhuys	In Perpetua	Portion 1 of Krantz Kloof No.104 Riversdale	Access to herd animals.
Unknown	User Rights - Water	Municipality	In Perpetua	Portion 4 of Farm Novo No.106 Riversdale.	Water provision for the Hessequa Municipality.
Unknown	User Rights - Water	JD Moodie	In Perpetua	Portion 17 (of 9) of The Farm “Groot Vaders Bosch” 114 Swellendam.	Water provision for Groot Vaders Bosch Estate
Unknown	User Rights - Water	JD Moodie	In Perpetua	Portion 17 (of 10) of The Farm “Groot Vaders Bosch” 114 Swellendam.	Water provision for Groot Vaders Bosch Estate
Unknown	User Rights – Gate Exit\Entrance to Bracken Hill.	Bracken Hill	Not Specified	FARM 656/0 - Exit\Entrance to Bracken Hill.	Gate: Exit\Entrance to Bracken Hill.
Unknown	Servitude - Pipeline (Hermitage Kloof)	Swellendam Municipality	Not specified	Farm Swellendam Forest Reserve 169/0	Gate: Access and pipeline on CapeNature

Date of Agreement	Type of Agreement	Partner	Duration of Agreement (years)	Area Affected	Conditions of use
					property for provision of water for Swellendam municipality.
Unknown	User Rights – Road. User access over CapeNature managed land to Dam.	Farm 180/1 & Farm 676/0	Not specified	Farm Leeuw Rivier Berg Forest Reserve No.171/0	Road: Access to dam.
Unknown	Temporary Rights – Weir. Maintenance of distribution wall and concrete water furrow at Mardouw.	Mardouw Olive Estate	Not specified	Farm Leeuw Rivier Berg Forest Reserve No.171/0	Road: access and distribution wall on CapeNature property for provision of water.
2006	Temporary Rights – Weir. Maintenance of distribution wall at Zuurberg.	Andre van Der Walt	Not specified	Farm No. 72/0 Suurberg.	Distribution wall on CapeNature property for provision of water
Unknown	Temporary Rights – Weir. Maintenance of distribution wall at Hermitage Kloof\Wolfkloof.	Bertus Streicher	Not specified	Farm Swellendam Forest Reserve 169/0	Road: access and distribution wall on CapeNature property for provision of water

8 EXPANSION STRATEGY

Protected area expansion in South Africa is guided by the National Protected Area Expansion Strategy (NPAES) (DEA 2016). In response to the NPAES, CapeNature has produced a Western Cape Protected Area Expansion Strategy (WCPAES) and Implementation Plan 2015-2020 (CapeNature 2015).

Mechanisms for protected area expansion include the promotion of stewardship options on private land in collaboration with landowners, regularising existing private nature reserves, and the consolidation of state land managed by conservation authorities such as municipalities and CapeNature as formal protected areas. The WCPAES has not highlighted priority marine zones for expansion, and planning for protected area expansion into the marine environment is guided by the NPAES.

The Langeberg Complex is supported by a network of adjacent or surrounding conserved areas ranging from Provincial Nature Reserves, Local Authority Nature Reserves, Private Nature Reserves and Stewardship sites, and is supported by the GCBR. The Complex comprises a number of adjoining as well as several disjunct components, some of which are buffered by provincial nature reserves and stewardship sites under formal agreement but most of which are linked by undeveloped land including private MCAs and conservancies. It should be noted that each of the 14 component nature reserves of the inland part of the Complex (excluding the Geelkrans Cluster) are directly connected to one another through the MCAs and the sites indicated on the WCPAES, thereby with the potential to form a single consolidated conservation area through the various mechanisms.

In addition to expanding the Protected Area network through stewardship, CapeNature will be increasing NEM: PAA compliance across the landscape. The focus will be on the appropriate vesting of state lands currently managed for biodiversity, the conversion of Local and Private Nature Reserves declared under the Nature Conservation Ordinance into NEM: PAA compliant Nature Reserves, and the regulation or other appropriate means of effecting meaningful protection to private MCAs.

The expansion map for the Langeberg Complex is available in Appendix 2 Map 13.

9 CONCEPT DEVELOPMENT PLAN

The concept development plan sets out the long-term plan for the development of the Langeberg Complex in keeping with the purpose of the Complex and with due consideration for protected area expansion and the zoning plan.

Tourism products and related infrastructure developments in CapeNature are considered investments and are intended to:

- Harness and enhance the income generation potential of protected areas with a view to achieving long term business sustainability;
- The provision of safe, informative and purpose-built access to protected areas;
- To enhance the operational efficiency and management of the Langeberg Complex.

9.1 Project Selection

From an organisational perspective potential tourism product developments are selected based on internal consultation and approval where factors such as environmental impact, appropriateness, environmental authorisation, financial feasibility and the apparent return on investment are considered. Where external approvals for developments are required, these are sought from the relevant authorities prior to the commencement of any development activities (Figure 9.1). CapeNature may elect to operate tourism products and services internally, or via other mechanisms described in the Public Finance Management Act, 1999 (Act No.1 of 1999) such as concessions or public private partnerships.

Figure 9.1: Concept Development Plan Framework.

9.2 Methodology

Tourism products and infrastructure within CapeNature protected areas are designed to be sensitive to their locations and are intended as prime examples of responsible and sustainable commercial developments. These include: off-grid bulk water and energy services; passive design efficiencies; enhanced resource utilisation, appropriate location and resource-saving features. Tourism developments aim to comply with prevailing zonation schemes and sensitivity analysis unless approval to the contrary has successfully been sought.

Wherever possible, tourism products, developments and services are intended to provide training and employment opportunities to communities within and surrounding the protected area.

9.3 Infrastructure Management and Development

No new tourism or other infrastructure developments are planned for the time span of this management plan. If new development plans are proposed, an amendment to this management plan will be drafted and approved.

Apart from new developments, existing infrastructure which mainly include boundary fences, jeep tracks, operational and visitor facilities, earth dams and water installations will be maintained and/or upgraded as required. This infrastructure maintenance list is not exhaustive.

10 STRATEGIC PLAN

This section presents the Strategic Plan for the Langeberg Complex. The strategic plan was derived from an assessment of the conservation situation, inclusive of the biological environment and the social, economic, cultural and institutional systems that influence values. Strategic intervention points formed the basis for developing strategies; using results chains to test theories of change and establish short to medium term objectives. From these, detailed actions with timeframes were developed to guide implementation, monitoring and evaluation.

Strategies are aimed at:

- Focal value restoration / stress reduction;
- Behavioural change / threat reduction; and
- Establishing / promoting enabling conditions.

A summary of selected strategies and objectives for the Langeberg Complex is provided in Table 10.1. Table 10.2 details the actions and associated timeframes for each separate strategy.

CapeNature will lead the implementation of the management plan, although achieving the vision requires coordinated effort. Stakeholder groups and organisations identified in the strategic plan are key role players in successful delivery of this management plan.

Table 10.1: Summary of strategies and objectives for the Langeberg Complex.

Threat(s) abated	Strategy Type	Strategy	Objectives
The negative impact of invasive alien vegetation on fire regime, biodiversity and water availability; Inappropriate fire regime.	Focal Value Restoration / Threat Reduction	**Strategy 1:** Enhance the implementation efficiency of invasive alien plant management by the integration of fire and invasive alien plant management through the development of an invasive alien species control plan for the Langeberg Complex.	**Objective 1.1:** By 2021, CapeNature have revised and approved the Langeberg Complex Invasive Alien Species control plan.
			Objective 1.2: By 2021 and beyond the Langeberg Complex Invasive Alien Species control plans are implemented.
The negative impact of invasive alien vegetation on fire regime, biodiversity and water availability; Inappropriate fire regime.	Enabling Conditions / Focal Value Restoration / Stress Reduction / Threat Reduction	**Strategy 2:** Enhance the fire and invasive alien plant management through the implementation of the CapeNature Integrated Catchment Management Strategy and Fire Policy, and future revisions.	**Objective 2.1:** By 2021 and beyond, the fire regime in the Langeberg Complex is determined to support management decisions with regards to fire and invasive alien vegetation management.
			Objective 2.2: By 2022, CapeNature have revised and implemented the Langeberg Complex Invasive Alien Species control plans.
The negative impact of invasive alien vegetation on fire regime, biodiversity and water availability; Inappropriate fire regime.	Enabling Conditions / Focal Value Restoration / Threat Reduction	**Strategy 3:** Through partnership, address invasive alien plant clearing and compliance within the zone of influence of the Langeberg Complex.	**Objective 3.1:** By 2021, CapeNature have prioritised neighbouring properties within the zone of influence of the Langeberg Complex for invasive alien plant clearing and/or compliance action.
			Objective 3.2: By 2022, CapeNature have obtained commitment from partners to assist with IAP clearing and compliance within the zone of influence of the Langeberg Complex.
The negative impact of invasive alien vegetation on fire regime, biodiversity and water availability; Inappropriate fire regime.	Enabling Conditions / Focal Value Restoration / Stress Reduction / Threat Reduction	**Strategy 4:** Practice integrated fire management as per the CapeNature fire policy (and by being National Veld and Forest Fire Act compliant) in conjunction with partners and stakeholders through the development of an integrated fire management plan for the Langeberg Complex.	**Objective 4.1:** By 2021, CapeNature have developed an Integrated Fire Management Plan for the Langeberg Complex.
			Objective 4.2: By 2022 and beyond the Langeberg Integrated Fire Management Plan is implemented.
			Objective 4.3: By 2022 CapeNature has developed and implemented a fine scale fire rapid response plan specific to the Langeberg Complex.
Agricultural expansion; Unsustainable and illegal harvesting of resources in	Enabling Conditions / Focal Value	**Strategy 5:** Promote co-operative governance by implementing the Langeberg Complex integrated compliance plans through the	**Objective 5.1:** By 2024 increase successful compliance interventions* from 2020 baseline. *Prevention, apprehension and prosecution.

Threat(s) abated	Strategy Type	Strategy	Objectives
the marine and estuary environment; Water pollution; Instream and Riparian Modification; Over abstraction of surface and ground water.	Restoration / Stress Reduction / Threat Reduction	enhancement of intergovernmental and relative Non-Governmental Organisations relationships that mitigate negative impacts on biodiversity through the compliance with legislation.	**Objective 5.2:** By 2020 and beyond all compliance and law enforcement entities agree on roles and responsibilities.
			Objective 5.3: By 2025 and beyond all on reserve recreational activities are managed and limited to designated areas.
			Objective 5.4: By 2025 protection systems or mechanisms for controlling legitimate and illegitimate access and activities are being implemented and there is a level of success.
			Objective 5.5: By 2021 and beyond all enforcement staff identified in the compliance plan have been appointed and trained.
Uncontrolled recreational activities; Unsustainable and illegal harvesting of resources in the marine and estuary environment.	Enabling Conditions / Stress Reduction / Threat Reduction	**Strategy 6:** Develop and implement a comprehensive, progressive management plan to facilitate sustainable, responsible access and tourism in the Langeberg Complex.	**Objective 6.1:** By 2021 initial reserve specific carrying capacity (type, number and frequency) for all non-consumptive utilisation for terrestrial and marine environment are set in line with sensitivity analysis and detailed zonation scheme (science based).
			Objective 6.2: By 2022 sustainable access* for a diversity of spiritual and cultural uses is determined, agreed upon, communicated and implemented. *Where, what, how much, frequency and compliant.
			Objective 6.3: By 2025, if needed, update reserve specific carrying capacity (type, number and frequency) for all non-consumptive utilisation are set in line with sensitivity analysis and detailed zonation scheme.
			Objective 6.4: By 2022, a Concept Development Framework that aligns future development (commercial and non-commercial) with zonation of the Langeberg Complex has been drafted and implemented.
Unsustainable and illegal harvesting of resources in the marine and estuary environment.	Focal Value Restoration / Stress Reduction / Threat Reduction	**Strategy 7:** Address the natural resource use in the marine and estuarine environment through implementation of the Geelkrans Nature Reserves Cluster Integrated Compliance Plan.	**Objective 7.1:** By 2024 increase successful compliance interventions* from 2020 baseline. *Prevention, apprehension and prosecution.

Threat(s) abated	Strategy Type	Strategy	Objectives
Water pollution; Over abstraction of surface and ground water; Instream and riparian modification; Unsustainable and illegal harvesting of resources in the marine and estuary environment; Agricultural expansion.	Enabling Conditions / Focal Value Restoration / Stress Reduction / Threat Reduction	**Strategy 8:** Through partnerships with relevant stakeholders' address: - Water use best practice and compliance; - Natural resource use in the marine and estuarine environment; - Prevention / monitoring / lack of knowledge regarding water pollution (to improve water quality); - Instream and riparian modification.	**Objective 8.1:** By 2021 and beyond, the quantity and quality of water abstracted by CapeNature are monitored.
			Objective 8.2: By 2021, and beyond river flow of NFEPA rivers are being monitored in line with CapeNature protocol.
			Objective 8.3: By 2021 the relevant government entities and stakeholders have been engaged with through PAAC and water use liaison structure channels on water use best practice and compliance.
			Objective 8.4: By 2022 all relevant stakeholders will be engaged with to implement the Goukou Estuary Management Plan objectives.
Water pollution; Over abstraction of surface and ground water; Instream and riparian modification; Unsustainable and illegal harvesting of resources in the marine and estuary environment; Agricultural expansion; Inappropriate fire regimes; The negative impact of Invasive alien vegetation on fire regime, biodiversity and water availability.	Enabling Conditions / Stress Reduction / Threat Reduction	**Strategy 9:** Develop and implement an integrated environmental education and awareness programme aimed at neighbours, resource users, school groups and visitors to nurture respect and care for the natural, cultural and historic values of the Langeberg Complex.	**Objective 9.1:** By 2021, CapeNature have revised and implemented the Langeberg Complex environmental education and awareness programme.
Inadequate access for socio-economic opportunities; Lack of training and job opportunities for the surrounding communities.	Enabling Conditions	**Strategy 10:** Contribute to economic and social development by providing job and training opportunities to Expanded Public Works Programme, contract and small, medium and micro-sized enterprise (SMME) staff.	**Objective 10.1:** By 2021, CapeNature have collated recommendations from existing reports that support tourism livelihoods and economic development in the zone of influence of the Langeberg Complex.
			Objective 10.2: By 2023, CapeNature have identified and prioritised viable economic development projects for implementation within the Langeberg Complex and its zone of influence.

Table 10.2: Strategic Plan for the Langeberg Complex.

STRATEGY 1:	Enhance the implementation efficiency of invasive alien plant management by the integration of fire and invasive alien plant management through the development of an invasive alien species control plan for the Langeberg Complex.
LINKED GOALS:	1; 2; 3; 4; 11; 14 (refer to Section 5.6)
THREATS:	The negative impact of Invasive alien vegetation on fire regime, biodiversity and water availability; Inappropriate fire regime.

Objectives	Actions	Responsibility	Time-frame	Measurable Indicators / Outputs	References / Existing Procedures
Objective 1.1: By 2021, CapeNature have revised and approved the Langeberg Complex Invasive Alien Species control plan.	Revise and approve the plan.	**Lead:** Conservation Managers On Reserve, Program manager - Natural Resource Management (NRM) **Enablers:** Landscape Ecologist; Ecological Coordinator; Integrated Catchment Specialist, Landscape Manager L1	Year 2	Updated Langeberg Complex Invasive Alien Species Control Plan (Reserve specific) which have projected treatment dates, appropriate methodologies and responsibilities and accountabilities identified and projected	Langeberg Complex Invasive Alien Species Control Plans
Objective 1.2: By 2021 and beyond the Langeberg Complex Invasive Alien Species control plans are implemented.	Collect density verification data all NBALS within the Langeberg Complex boundary	**Lead:** Conservation Managers On Reserve, Program manager – Natural Resource Management **Enablers:** Ecological Coordinator, Integrated Catchment Specialist, GIS Technician	Year 1 and beyond	Density data spreadsheet	Standard annual procedure
	Compile prioritisation maps for the Langeberg Complex.	**Lead:** Biodiversity Conservation Innovation Unit Geographic Information Systems (GIS)	Annually	Maps and shapefiles	
	Compilation of Integrated Work Plan, APO of the Langeberg Complex	**Lead:** Conservation Manager On Reserve **Enablers:** Ecological Coordinator, Integrated Catchment Specialist, Relevant Internal Stakeholders	Annually	Integrated Work Plan and Annual Plan of Operation	

STRATEGY 1:	Enhance the implementation efficiency of invasive alien plant management by the integration of fire and invasive alien plant management through the development of an invasive alien species control plan for the Langeberg Complex.				
LINKED GOALS:	1; 2; 3; 4; 11; 14 (refer to Section 5.6)				
THREATS:	The negative impact of Invasive alien vegetation on fire regime, biodiversity and water availability; Inappropriate fire regime.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
	Compile progress report on implementation of APOs.	**Lead:** Project Managers and staff **Enablers:** Conservation Managers on Reserve	Annually	Progress report, Management Information System report	

STRATEGY 2:	Enhance the fire and invasive alien plant management through the implementation of the CapeNature Integrated Catchment Management Strategy and Fire Policy, and future revisions.				
GOALS:	1; 2; 3; 14 (refer to Section 5.6)				
THREATS:	The negative impact of Invasive alien vegetation on fire regime, biodiversity and water availability; Inappropriate fire regime.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
Objective 2.1: By 2021 and beyond, the fire regime in the Langeberg Complex is determined to support management decisions with regards to fire and invasive alien vegetation management.	Analyses of fire frequency, fire return interval, fire size and season for Mountain Fynbos.	**Lead:** Landscape Ecologist **Enablers:** Ecological Coordinator, Integrated Catchment Specialist, GIS Scientist and technician	Year 1 and beyond	Post-fire season executive summary	Post-fire season executive summary
	Conduct post-fire and permanent *Protea* monitoring to determine thresholds of potential concern.	**Lead:** Conservation managers on Reserve **Enablers:** Ecological Coordinator and Landscape Ecologist	Year 1 and beyond	Analysed data, Thresholds of potential concern	Monitoring protocols
	Investigate appropriate fire regimes for coastal vegetation.	**Lead:** Landscape Ecologist **Enablers:** Ecological Coordinator, Conservation Manager on Reserve, Ecologist Flora	Year 5	Monitoring and appropriate fire regime identified	
Objective 2.2: By 2022, CapeNature have revised and implemented the Langeberg Complex Invasive Alien Species control plans.	Revise and implement the approved plan.	**Lead:** Conservation Manager **Enablers:** Landscape Ecologist; Ecological Coordinator; Integrated Catchment Specialist; Landscape Manager L1	Year 3	Proportion of Invasive Alien Plant hectares cleared or maintained	Integrated Work Plan and Integrated Annual Plan of Operations.

STRATEGY 3:	Through partnership, address invasive alien plant clearing and compliance within the zone of influence of the Langeberg Complex.				
GOALS:	1; 2; 3; 14 (refer to Section 5.6)				
THREATS:	The negative impact of Invasive alien vegetation on fire regime, biodiversity and water availability; Inappropriate fire regime.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
Objective 3.1: By 2021, CapeNature have prioritised neighbouring properties within the zone of influence of the Langeberg Complex for invasive alien plant clearing and/or compliance action.	Prioritise neighbouring properties for IAP clearing and/or compliance action.	**Lead:** Conservation Manager Off Reserve **Enablers:** Integrated Catchment Specialist; Landscape Manager L1, Landscape Manager L2	Year 2	List of priority properties	
Objective 3.2: By 2022, CapeNature have obtained commitment from partners to assist with IAP clearing and compliance within the zone of influence of the Langeberg Complex.	Obtain commitment and action from relevant partners.	**Lead:** Conservation Manager Off Reserve **Enablers:** Integrated Catchment Specialist; Landscape Manager L1, Landscape Manager L2	Year 3	Minutes of meetings and email correspondence; Partner funding committed; Partner directives issued	Invasive Alien Species legislation

STRATEGY 4:	Practice integrated fire management as per the CapeNature fire policy (and by being National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) compliant) in conjunction with partners and stakeholders through the development of an integrated fire management plan for the Langeberg Complex.				
GOALS:	1; 13; 14 (refer to Section 5.6)				
THREATS:	The negative impact of Invasive alien vegetation on fire regime, biodiversity and water availability; Inappropriate fire regime.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
Objective 4.1: By 2021, CapeNature have developed an Integrated Fire Management Plan for the Langeberg Complex.	Develop an Integrated Fire Management Plan for the Langeberg Complex taking into account the opportunities and threats within the Invasive Alien Plant control plan.	**Lead:** Integrated Catchment Specialist, Disaster Manager **Enablers:** Landscape Ecologist; Ecological Coordinator; Landscape Manager L1	Year 1	Langeberg Complex Integrated Fire Management Plan	CapeNature Fire Policy
Objective 4.2: By 2022 and beyond the Langeberg Integrated Fire Management Plan is implemented.	Implement Integrated Fire Management Plan for the Langeberg Complex.	**Lead:** Integrated Catchment Specialist, Conservation manager on Reserve **Enablers:** Ecological Coordinator and Landscape Ecologist	Year 1 and beyond	Healthy fire regime in the Langeberg Mountain Complex.	Integrated Fire Management Plan for the Langeberg Complex
Objective 4.3: By 2022 CapeNature has developed and implemented a fine scale fire rapid response plan specific to the Langeberg Complex.	Develop and implement a fine scale plan to enable rapid response to fires in the Langeberg Complex.	**Lead:** Integrated Catchment Specialist, Disaster Manager **Enablers:** Conservation Managers On and Off Reserve, Landscape Ecologist, Landscape Manager L1, Landscape Manager L2	Year 2	A fine scale rapid response plan to fire specific to the Langeberg Complex	Regional response plan

STRATEGY 5:	Promote co-operative governance by implementing the Langeberg Complex integrated compliance plans through the enhancement of intergovernmental and relative Non-Governmental Organisations relationships that mitigate negative impacts on biodiversity through the compliance with legislation.				
GOALS:	1; 2; 3; 5; 6; 7; 8; 9; 10; 14 (refer to Section 5.6)				
THREATS:	Agricultural expansion; Unsustainable and illegal harvesting of resources in the marine and estuary environment; Water pollution; Instream and Riparian Modification; Over abstraction of Surface and Ground Water.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
Objective 5.1: By 2024 increase successful compliance interventions* from 2020 baseline. *Prevention, apprehension and prosecution.	Identify common issues that require elevated effort and focus.	**Lead:** Conservation Manager On Reserve, Conservation Manager Off Reserve **Enablers:** Identified as needed	Year 1	Number of action plans that renders a positive effect.	Reserve specific Integrated Compliance Plans
	Maintain baseline of 2020 compliance interventions.	**Lead:** Conservation Manager On Reserve **Enablers:** Conservation Manager Off Reserve	Year 1	Number of successful compliance interventions in 2020	
Objective 5.2: By 2020 and beyond all compliance and law enforcement entities agree on roles and responsibilities.	Develop and implement a long term integrated compliance plan to integrate and complement relevant initiatives planned by law enforcement entities and neighbors.	**Lead:** Conservation Manager On Reserve, Conservation Manager Off Reserve **Enablers:** Land Use Scientists, Stakeholder Engagement Officer, Compliance and Enforcement Staff	Year 2 and annually thereafter	APO aligned to long term Integrated Compliance Plan (ICP) objectives	Relevant suite of environmental legislation and associated regulations, by laws and Policy
Objective 5.3: By 2025 and beyond all on reserve recreational activities are managed and limited to designated areas.			Year 6 – Year 10	Communication Plan aligned to long term ICP objectives Reduction in repeat offenders Number of compliance interventions, including joint interventions	Compliance & Enforcement Database; Illegal Activities Database
Objective 5.4: By 2025 protection systems or mechanisms for controlling legitimate and illegitimate access and activities are	Draft and implement an Annual Plan of Operations in collaboration with relevant law enforcement entities		Year 6	Number of compliance interventions Reduction in repeat offenders	Compliance and Enforcement Database; Illegal Activities Database

STRATEGY 5:	Promote co-operative governance by implementing the Langeberg Complex integrated compliance plans through the enhancement of intergovernmental and relative Non-Governmental Organisations relationships that mitigate negative impacts on biodiversity through the compliance with legislation.				
GOALS:	1; 2; 3; 5; 6; 7; 8; 9; 10; 14 (refer to Section 5.6)				
THREATS:	Agricultural expansion; Unsustainable and illegal harvesting of resources in the marine and estuary environment; Water pollution; Instream and Riparian Modification; Over abstraction of Surface and Ground Water.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
being implemented and there is a level of success.				% structures in good condition	
Objective 5.5: By 2021 and beyond all enforcement staff identified in the compliance plan have been appointed and trained.	Implement a training programme to develop staff skill and ability.	**Lead:** Compliance and Enforcement **Enablers:** Conservation Manager On Reserve, Conservation Manager Off Reserve, Human Resources, Landscape Manager L1	Year 2 and a refresher every 2 years thereafter	Compliance & law enforcement training programme Number of trained and capacitated staff	Training Register; Appointment letters & cards

STRATEGY 6:	Develop and implement a comprehensive, progressive management plan to facilitate sustainable, responsible access and tourism in the Langeberg Complex.				
GOALS:	1; 6; 7; 8; 9; 10; 11; 12 (refer to Section 5.6)				
THREATS:	Uncontrolled recreational activities; Unsustainable and illegal harvesting of resources in the marine and estuary environment.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
Objective 6.1: By 2021 initial reserve specific carrying capacity (type, number and frequency) for all non-consumptive utilisation for terrestrial and marine environment are set in line with sensitivity analysis and detailed zonation scheme (science based).	List all activities and current and desired infrastructure (including initiation sites), and collate information on user groups, current numbers, projected future use and limits thereon.	**Lead:** Conservation manager On Reserve **Enablers:** Stakeholder Engagement Officer, Integrated Catchment Specialist, Eco-Tourism and Access Manager	Year 1	List of activities and user groups	Zonation Scheme
	Translate information into a detailed zonation scheme and related rules based on sensitivity information.	**Lead:** Landscape Ecologist **Enablers:** Conservation Manager On Reserve, Capabilities Manager Marine and Coast, Integrated Catchment Specialist, Eco-Tourism and Access Manager	Year 1	Detailed zonation scheme and rules that addresses the full suite and diversity of non-consumptive uses desired in the Complex	Zonation Scheme
Objective 6.2: By 2022 sustainable access* for a diversity of spiritual and cultural uses is determined, agreed upon, communicated and implemented. *Where, what, how much, frequency and compliant.	Identify sustainable sites suitable for spiritual and cultural activities (*e.g.* initiation) and set site specific carrying capacities for each activity.	**Leader:** Conservation manager On Reserve **Enablers:** Landscape Ecologist, Ecological Coordinator, Integrated Catchment Specialist, Stakeholder Engagement Manager	Year 2	Sustainable sites with carrying capacities suitable for spiritual and cultural activities have been identified.	Zonation Scheme
Objective 6.3: By 2025, if needed, update reserve specific carrying capacity (type, number and frequency) for all non-consumptive utilisation are set in line with sensitivity	As needed, update the detailed reserve zonation based on available information.	**Leader:** Conservation manager On Reserve **Enablers:** Landscape Ecologist, Ecological Coordinator, Integrated Catchment Specialist,	Year 5	Updated detailed reserve zonation based on available information	Zonation Scheme

STRATEGY 6:	Develop and implement a comprehensive, progressive management plan to facilitate sustainable, responsible access and tourism in the Langeberg Complex.				
GOALS:	1; 6; 7; 8; 9; 10; 11; 12 (refer to Section 5.6)				
THREATS:	Uncontrolled recreational activities; Unsustainable and illegal harvesting of resources in the marine and estuary environment.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
analysis and detailed zonation scheme.		Stakeholder Engagement Manager			
Objective 6.4: By 2022, a Concept Development Framework that aligns future development (commercial and non-commercial) with zonation of the Langeberg Complex has been drafted and implemented.	Investigate and evaluate responsible tourism facilities, products and services for commercial and recreational use in alignment with the zonation plan.	**Leader:** Conservation Manager On Reserve **Enablers:** Landscape Ecologist, Ecological Coordinator, Integrated Catchment Specialist, Eco-Tourism and Access Manager	Year 2	Conservation Development Framework	Zonation Scheme
	Integrate into an updated CDP in preparation for the update of the Langeberg Complex PAMP (2031 - 2040).	**Leader:** Landscape Ecologist **Enablers:** Conservation Manager On Reserve, Ecological Coordinator, Integrated Catchment Specialist, Eco-Tourism and Access Manager	Year 8	Conservation Development Framework	Zonation Scheme
	Incorporate the CDP into the Municipal Spatial Development Plans	**Leader:** Mainstreaming Specialist **Enablers:** Landscape Manager L2	Year 8	Conservation Development Framework	Zonation Scheme

STRATEGY 7:	Address the natural resource use in the marine and estuarine environment through implementation of the Geelkrans Nature Reserves Cluster Integrated Compliance Plan.				
GOALS:	10; 11 (refer to Section 5.6)				
THREATS:	Unsustainable and illegal harvesting of resources in the marine and estuary environment.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
Objective 7.1: By 2024 increase successful compliance interventions* from 2020 baseline. *Prevention, apprehension and prosecution.	Identify common issues that require elevated effort and focus.	**Leader:** Conservation Manager On Reserve **Enablers:** Marine and Coastal Specialist, Compliance and Enforcement Specialist, Marine Support Officers, Landscape Manager L2	Year 1	Number of action plans that renders a positive effect.	Geelkrans Integrated Compliance Plans
	Maintain baseline of 2020 compliance interventions.	**Leader:** Conservation Manager On Reserve **Enablers:** Marine and Coastal Specialist, Compliance and Enforcement Specialist, Marine Support Officers	Year 1	Number of successful compliance interventions in 2020	
	Develop and implement action plans for the focal issues.	**Leader:** Conservation Manager On Reserve **Enablers:** Marine and Coastal Specialist, Compliance and Enforcement Specialist, Marine Support Officers	Year 5	Number of successful compliance interventions in 2024	
	Maintain a baseline of human dimensions in order to make informed decisions with regards to marine user groups.	**Leader:** Conservation Manager On Reserve **Enablers:** Marine and Coastal Specialist, Compliance and Enforcement Specialist, Marine Support Officers	Year 1	Up to date human dimensions data base	Stilbaai Marine Protected Area

STRATEGY 8:	Through partnerships with relevant stakeholders' address: - Water use best practice and compliance - Natural resource use in the marine and estuarine environment - Prevention/monitoring/lack of knowledge regarding water pollution (to improve water quality) - Instream and riparian modification.				
GOALS:	4; 6; 7; 8; 9; 10; 11; 12 (refer to Section 5.6)				
THREATS:	Water pollution; over abstraction of surface and ground water; Instream and riparian modification; Unsustainable and illegal harvesting of resources in the marine and estuary environment; Agricultural expansion.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
Objective 8.1: By 2021 and beyond, water abstraction quantity and water quality of CapeNature are being monitored.	Monitor water abstraction quantity and water quality of CapeNature boreholes within the Langeberg Complex where abstraction is taking place according to CapeNature monitoring protocol. Implement the recommendations resulting from the groundwater monitoring as indicated in the annual report provided in terms of the groundwater monitoring protocol	**Lead:** Conservation Manager on Reserve **Enablers:** Freshwater Scientist	Annually	Freshwater Monitoring report	Monitoring protocol
Objective 8.2: By 2021, and beyond river flow of NFEPA rivers are being monitored in line with CapeNature protocol.	Monitor river flow of NFEPA rivers where water is being abstracted	**Lead:** Conservation Manager on Reserve **Enablers:** Freshwater Scientist	Annually	Freshwater Monitoring report	CapeNature river flow monitoring protocol.
Objective 8.3: By 2021 the relevant government entities and stakeholders have been engaged with through PAAC and water use liaison structure channels on water	Initiate engagement and maintain communication with relevant entities.	**Lead:** Integrated Catchment Specialist **Enablers:** Conservation Manager on Reserve, Landscape Manager L1	Year 1	Minutes of meetings	PAAC

STRATEGY 8:	Through partnerships with relevant stakeholders' address: - Water use best practice and compliance - Natural resource use in the marine and estuarine environment - Prevention/monitoring/lack of knowledge regarding water pollution (to improve water quality) - Instream and riparian modification.				
GOALS:	4; 6; 7; 8; 9; 10; 11; 12 (refer to Section 5.6)				
THREATS:	Water pollution; over abstraction of surface and ground water; Instream and riparian modification; Unsustainable and illegal harvesting of resources in the marine and estuary environment; Agricultural expansion.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
use best practice and compliance.					
Objective 8.4: By 2022 all relevant stakeholders will be engaged with to implement the Goukou Estuary Management Plan objectives.	Initiate engagement and maintain communication with relevant entities.	**Lead:** Conservation Manager on Reserve **Enablers:** Marine and Coastal Specialist, Integrated Catchment Specialist, Landscape Manager L1	Year 1	Minutes of meetings	PAAC

STRATEGY 9:	Develop and implement an integrated environmental education and awareness programme aimed at neighbours, resource users, school groups and visitors to nurture respect and care for the natural, cultural and historic values of the Langeberg Complex.				
GOALS:	1 – 14 (refer to Section 5.6)				
THREATS:	Water pollution; Over abstraction of surface and ground water; Instream and riparian modification; Unsustainable and illegal harvesting of resources in the marine and estuary environment; Inappropriate fire regimes; Agricultural expansion; The negative impact of Invasive alien vegetation on fire regime, biodiversity and water availability.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
Objective 9.1: By 2021, CapeNature have revised and implemented the Langeberg Complex environmental education and awareness programme.	Revise and implement the approved reserve cluster plans.	**Lead:** Learning Officers **Enablers:** Stakeholder Engagement Officer, Conservation Manager Off Reserve, Stakeholder Engagement Officers, relevant staff as identified	Year 2	Number of awareness events	Environmental education, awareness and interpretation programme; Integrated Work Plan

STRATEGY 10:	Contribute to economic and social development by providing job and training opportunities to Expanded Public Works Programme, contract and small, medium and micro-sized enterprise (SMME) staff.				
GOALS:	11 (refer to Section 5.6)				
THREATS:	Lack of training and job opportunities for the surrounding communities; Inadequate access for socio-economic opportunities.				
Objectives	**Actions**	**Responsibility**	**Time-frame**	**Measurable Indicators / Outputs**	**References / Existing Procedures**
Objective 10.1: By 2021, CapeNature have collated recommendations from existing reports that support tourism livelihoods and economic development in the zone of influence of the Langeberg Complex.	Source, collate and develop a feedback loop with regards to recommendations from existing reports to partners and communities.	**Lead:** Stakeholder Engagement Officer, Project Officer **Enablers:** Conservation Manager on Reserve, Project manager NRM, Project Specialist: Analytics, Land Use Scientist	Annually	Summary report	Municipal IDPs and SDFs
	Determine the process to include CapeNature input (job creation, projects, developments, conservation actions, tourism developments, etc.) into local Municipality IDPs.	**Lead:** Landscape Manager L1, Stakeholder Engagement Officer, Project Officer **Enablers:** Conservation Manager on Reserve, Project manager NRM, Project Specialist: Analytics, Land Use Scientist	Annually	Summary report	Municipal IDPs and SDFs
Objective 10.2: By 2023, CapeNature have identified and prioritised viable economic development projects for implementation within the Langeberg Complex and its zone of influence.	Implement existing and additional economic development opportunities as funding becomes available.	**Lead:** Landscape Manager L1, Stakeholder Engagement Officer, Project Officer **Enablers:** Conservation Manager on Reserve, Project manager NRM, Project Specialist: Analytics, Land Use Scientist	Annually	SMME register; MIS report	Municipal IDPs and SDFs

11 COSTING

This section provides an overview of costing and fund allocation for strategies. It outlines the existing financial resources (current budget), funding shortfalls, sources of alternate funding and future financial projections.

11.1 Finance and Asset Management

In line with the legal requirement, the strategies identified for implementation within the Langeberg Complex, to achieve the desired state, have been costed below.

The Langeberg Complex will adhere to the guiding principles listed below:

- Responsibly manage the allocation of budget, revenue raising activities and expenditure;
- Ensure solid financial management supporting the achievement of the objectives of this plan; and
- Compliance with the Public Finance Management Act, 1999 (Act No. 1 of 1999) as well as CapeNature's financial policies and procedures.

Using a zero-based budgeting approach, a funding estimate was derived based upon the activities in this management plan. When estimating the costing, the following items were considered:

- Those costs and associated resources which could be allocated to specific activities and which were of a recurring nature;
- Those costs and associated resources which could be allocated to specific activities but which were of a once-off nature;
- Unallocated fixed costs (water, electricity, phones, bank fees, *etc.*);
- Maintenance of infrastructure; and
- Provision for replacement of minor assets, (furniture, electronic equipment, vehicles, *etc.*).

11.1.1 Income

CapeNature's budget is funded by the Medium Term Expenditure Framework (MTEF) allocation, other government grants and generated from own revenue sources derived from commercial activities. Any surplus revenue generated is used to fund shortfalls in management costs across the organisation.

CapeNature has overhead costs relating to support services such as human resources, marketing and eco-tourism, finance, biodiversity support, conservation services, people and conservation, legal services, *etc.* which is not allocated to individual protected area complexes and must also be funded through grant funding or own revenue generated.

This management plan is a 10-year plan, and thus straddles multiple MTEF periods that impact on actual budget allocation and projection.

Total income projected for 2020/21 is budgeted at R 8 731 272, increasing at an estimated annual rate of 10% from previous years. A summary is presented in Table 11.1.

Table 11.1: A summary of the total projected income for the Langeberg Complex.

Allocation	2018/19	2019/20	2020/21
Total Income	R5 375 301	R7 937 521	R8 731 272
MTEF Funding	R7 257 595	R8 790 544	R9 669 598
External Funding	R2 387 071	R39 056 533	R6 831 258

11.1.2 Expenditure

11.1.2.1 Recurring costs

The annual directly allocated cost (includes staff, transport and travel, stores and equipment) is estimated at R 8 731 272 for 2020/21. These ongoing costs are split according to strategies as illustrated in Figure 11.1.

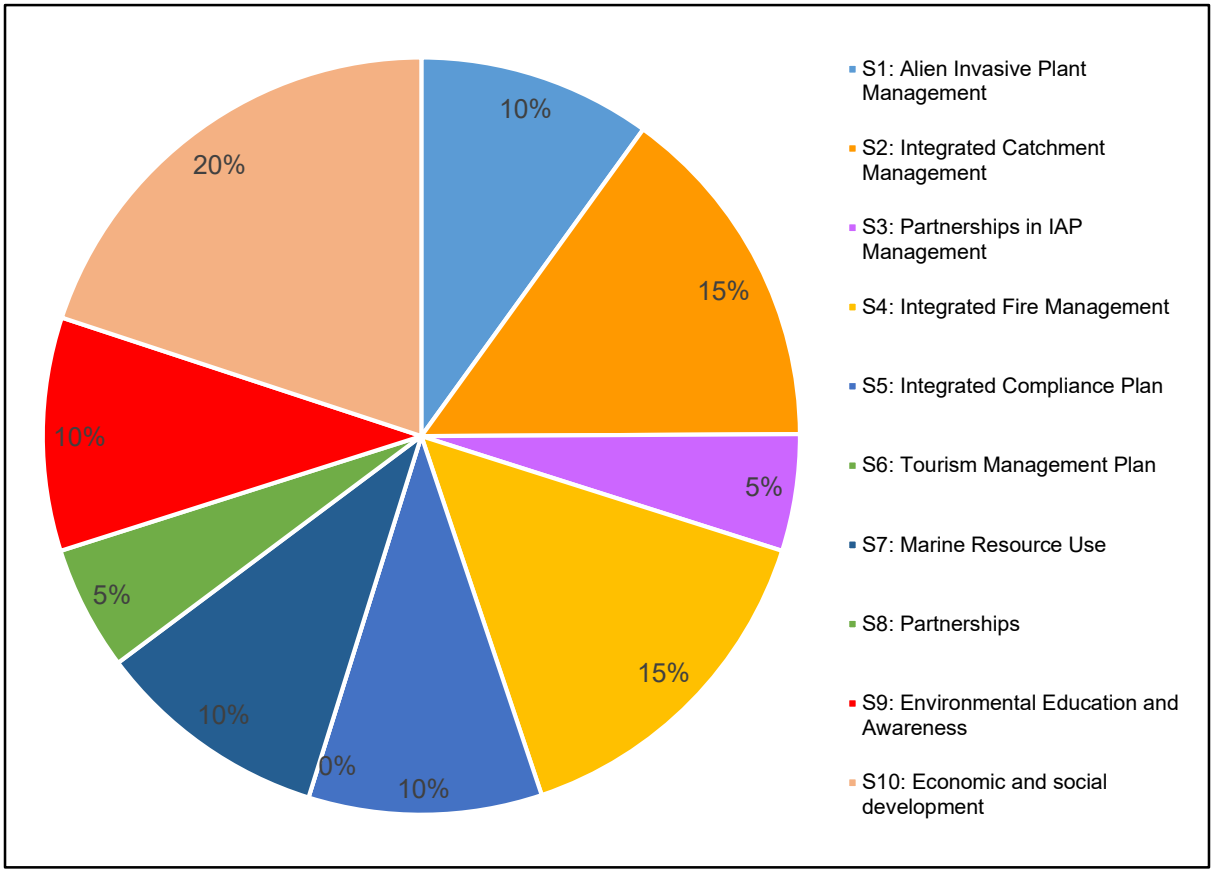

Figure 11.1: The estimated proportion of annual operational costs for the Langeberg Complex for year 2020/21 aligned with the identified and prioritised strategies.

11.1.2.2 Once off costs

In addition to the recurring costs there might be once-off replacement costs of assets, *e.g.* tractor, firefighting equipment, field equipment, *etc*. that are aligned with the life span of the relevant assets being replaced.

11.1.2.3 Maintenance

An annual earmarked allocation is provided for the development of new, and upgrades and maintenance of tourism infrastructure. Tourism projects are prioritised across all CapeNature facilities and maintenance is scheduled accordingly.

11.1.2.4 Summary

It is estimated that the Langeberg Complex will require an annual operating budget of R 8 731 272 for 2020/21, increasing at a projected annual rate of 10%.

11.1.2.5 Implications

Unsuccessful securing of external funding and replacement of crucial capital equipment could lead to potential shortfall and will have a negative impact on strategies throughout.

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APPENDIX 1 Langeberg Complex Land Parcel Table

APPENDIX 2 Maps of the Langeberg Complex.

APPENDIX 3 Stakeholder Engagement Report for the Langeberg Complex.

LANGEBERG COMPLEX

Western Cape, South Africa

STAKEHOLDER ENGAGEMENT PROCESS REPORT

COMPILED BY FOOTPRINT ENVIRONMENTAL SERVICES

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APPENDIX 1 Declarations of the land parcels of the Langeberg Complex.

Table 1: Land parcels that comprise World Heritage Sites (proclaimed in terms of Notice 72 of 2009) and Marine Protected Areas in the Langeberg Complex WHS.

Title Deed	Farm name	Farm No.	Portion No.	Extent (ha)	Registration Division	SG Code	Landowner	Proclam. Date	Proclam. No.	Govt. Gazette	Status	Period (years)
Grootvadersbos Nature Reserve Cluster												
T7089/1959	The Grootvadersbosch Estate	114	RE/17	401.57	Swellendam	C07300000000011400017	Republic of South Africa	20 January 1978	112/78	5860	Wilderness Area	41
T7074/1959	The Grootvadersbosch Estate	114	RE/18	446.89	Swellendam	C07300000000011400018	Republic of South Africa	20 January 1978	112/78	5860	Wilderness Area	41
Unallocated State Land	Middel van Duiwenhoks Rivier	77	0	10955.9	Swellendam	C07300000000007700000	Republic of South Africa	20 January 1978	112/78	5860	Wilderness Area	41
Unallocated State Land	Lot A	82	0	1568.9	Riversdale	C06400000000008200000	Republic of South Africa	20 January 1978	112/78	5860	Wilderness Area	41
T21666/1963	None	RE/96	0	659.16	Swellendam	C07300000000009600000	Republic of South Africa	20 January 1978	112/78	5860	Wilderness Area	41
Geelkrans Nature Reserve Cluster												
N/A	Stilbaai Marine Protected Area	N/A	N/A	3304.81	N/A	N/A	N/A	17 October 2008	1109 of 2008	31517	Marine Protected Area	11
Land parcels in the Langeberg Complex that comprise World Heritage Sites inscribed by UNESCO, but not yet proclaimed as WHS.												
Marloth Nature Reserve Cluster												
T25361/1993	Swellendam Forest Reserve	RE/169	0	4010.58	Swellendam	C07300000000016900000	Republic of South Africa	13 February 1981.	213	213 of 1981	State Forest Nature Reserve	38
T34667/1998	Swellendam Forest Reserve	169	1	25.31	Swellendam	C07300000000016900001	Republic of South Africa	13 February 1981.	213	213 of 1981	State Forest Nature Reserve	38
Unallocated State Land	Leeuw River Berg Forest Reserve	170	0	642.37	Swellendam	C07300000000017000000	Republic of South Africa	13 February 1981.	213	213 of 1981	State Forest Nature Reserve	38
Unallocated State Land	Leeuw River Berg Forest Reserve	171	0	4296.08	Swellendam	C07300000000017100000	Republic of South Africa	13 February 1981.	213	213 of 1981	State Forest Nature Reserve	38

Unallocated State Land	Leeuw River Berg Forest Reserve	177	0	1216.03	Montagu	C05000000000017700000	Republic of South Africa	13 February 1981.	213	213 of 1981	State Forest Nature Reserve	38
Unallocated State Land	The Farm No. 183	183	0	1125.57	Montagu	C05000000000018300000	Republic of South Africa	13 February 1981.	213	213 of 1981	State Forest Nature Reserve	38
Unallocated State Land	Twist Niet Forest Reserve	162	0	1177.01	Montagu	C05000000000016200000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest	13
T7727/1897	Waterfall	121	1	504.38	Montagu	C05000000000012100001	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest	13
Unallocated State Land	Forest Reserve	72	0	1229.86	Swellendam	C07300000000007200000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest	13
Grootvadersbos Nature Reserve Cluster												
T7096/1964	Assagaaibosch	RE/101	0	163.37	Riversdale	C06400000000010100000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T46219/2000	Lot 238 (Ptn of Lot 155) Riversdale Settlement *	Portion of 238	0	118.99	Riversdale	C06400040000023800000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T46219/2000	Lot 239 (Ptn of Lot 157) Riversdale Settlement *	Portion of 239	0	56.68	Riversdale	C06400040000023900000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T46219/2000	Lot 240 (Ptn of Lot 159) Riversdale Settlement *	Portion of 240	0	53.92	Riversdale	C06400040000024000000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T46219/2000	Lot 241 (Ptn of Lot 161) Riversdale Settlement *	Portion of 241	0	74.83	Riversdale	C06400040000024100000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T3813/1957	Karee-Kop	66	0	1110.83	Riversdale	C06400000000006600000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13

T5591/1937	Kristal Kloof	71	0	786.33	Riversdale	C06400000000007100000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T7882/1942	Kampsche Berg	72	0	249.12	Riversdale	C06400000000007200000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
Unallocated State Land	Mozambique Kop Forest Reserve	73	0	1021.14	Riversdale	C06400000000007300000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
Unallocated State Land	Rheeboks Laagte Outspan	74	0	21.2	Riversdale	C06400000000007400000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
Unallocated State Land	Brandwacht	75	0	329.62	Riversdale	C06400000000007500000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
Unallocated State Land	Oudebosch Forest Reserve	76	0	1421.74	Riversdale	C06400000000007600000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
Unallocated State Land	Forest No. 77	77	0	993.41	Riversdale	C06400000000007700000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T7089/1959	The Grootvadersbosch Estate	114	RE/17	361.41	Swellendam	C07300000000011400017	Republic of South Africa	17 June 2005	Notice 554 of 2005	27664	State land released from State Forest.	14
T7074/1959	The Grootvadersbosch Estate	114	RE/18	242.10	Swellendam	C07300000000011400018	Republic of South Africa	17 June 2005	Notice 554 of 2005	27664	State land released from State Forest.	14
Unallocated State Land	Grootvadersbos	RE/656	0	327.94	Swellendam	C07300000000065600000	Republic of South Africa	17 June 2005	Notice 554 of 2005	27664	State Forest	14
Unallocated State Land	Grootvadersbos	656	1	5.05	Swellendam	C07300000000065600001	Republic of South Africa	17 June 2005	Notice 554 of 2005	27664	State land released from State Forest.	14
Unallocated State Land	Grootvadersbos	656	2	5.69	Swellendam	C07300000000065600002	Republic of South Africa	17 June 2005	Notice 554 of 2005	27664	State land released from State Forest.	14

Unallocated State Land	Paarde Berg Forest	150	0	559.23	Riversdale	C06400000000015000000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T153/1950	Spion Kop	143	0	127.82	Riversdale	C06400000000014300000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T20057/1966	De Berg	144	4	1128.75	Riversdale	C06400000000014400004	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T56009/2001	Paarden Berg	RE/152	0	835.85	Riversdale	C06400000000015200000	WC Provincial Government	5 May 2006	Notice 596 of 2006	28797	Provincial land	13
Unallocated State Land	Witte Els Berg	44	0	1130.47	Riversdale	C06400000000004400000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T25478/1968	Tygerberg	55	0	812.09	Riversdale	C06400000000005500000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13

*Further action is required to address the registration and reservation of these identified land parcels.

In the tables above, all state land released from state forest needs to be reserved for the Western Cape Government to be declared as provincial nature reserves.

Appendix Table 2: Land parcels in the Langeberg Complex that comprise Provincial Nature Reserves, Forest Nature Reserves, WWF property and other State Land (ex-State Forests) not included in the World Heritage Site nomination.

Title Deed	Farm name	Farm No.	Portion No.	Extent (ha)	Registration Division	SG Code	Landowner	Proclam. Date	Proclam. No.	Govt. Gazette	Status	Period (years)
Geelkrans Nature Reserve Cluster												
T25707/1971	Blomboschfontein	495	74	0.91	Riversdale	C06400000000049500074	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
Consolidation still to be registered	Blomboschfontein *	495	85	264.19	Riversdale	C06400000000049500085	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest	13
T12284/1905	Kleine Jongens Fontein	RE/494	0	513.38	Riversdale	C06400000000049400000	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T7294/1977	Kleine Jongens Fontein	494	38	12.72	Riversdale	C06400000000049400038	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T7293/1977	Kleine Jongens Fontein	494	39	13.57	Riversdale	C06400000000049400039	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T5203/1970	Kleine Jongens Fontein	494	40	4.46	Riversdale	C06400000000049400040	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T40185/1974	Kleine Jongens Fontein	494	42	2.52	Riversdale	C06400000000049400042	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T54120/1987	Kleine Jongens Fontein	494	43	8.96	Riversdale	C06400000000049400043	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T9863/1979	Kleine Jongens Fontein	494	44	9.15	Riversdale	C06400000000049400044	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13

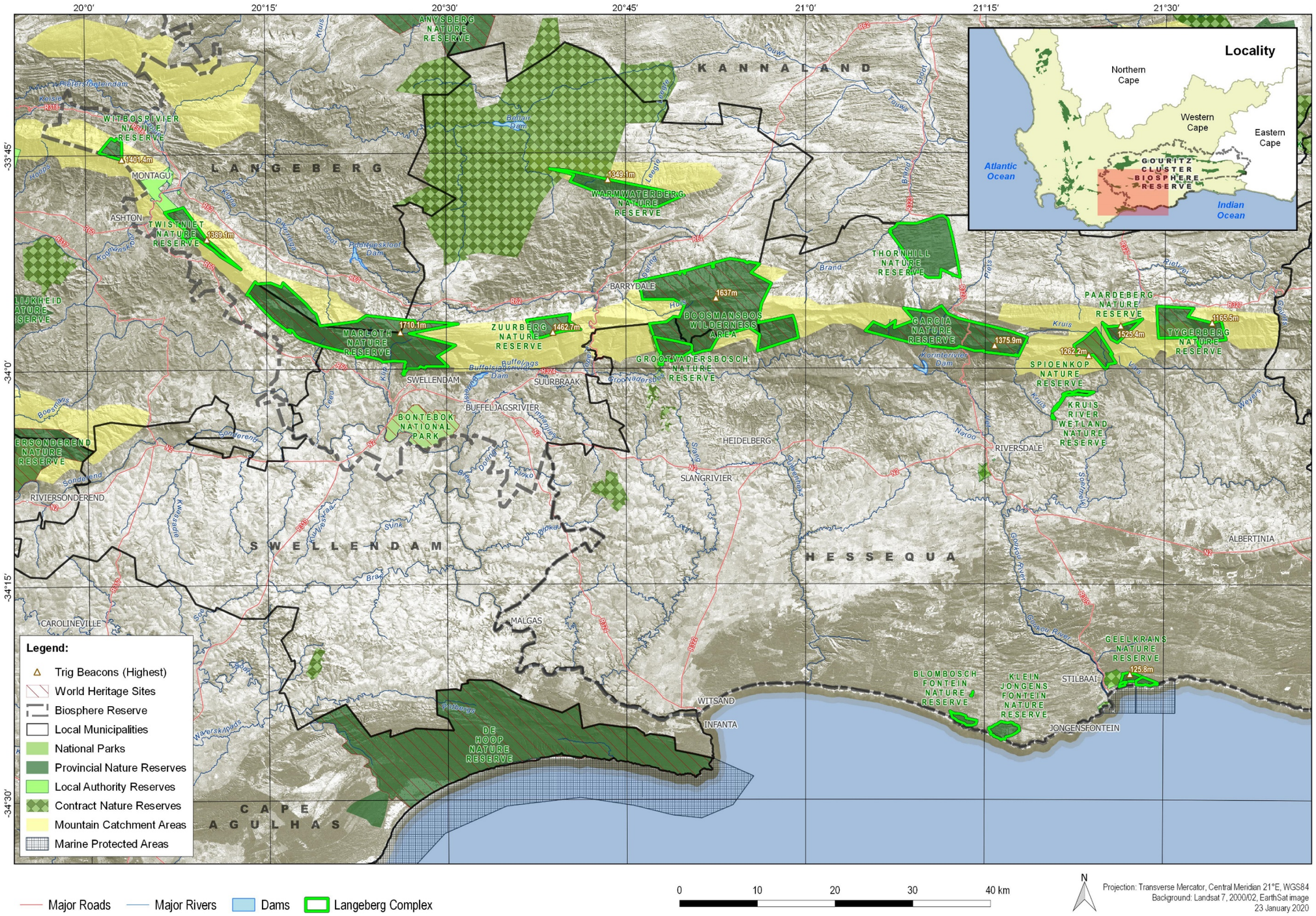
T7075/1981	Kleine Jongens Fontein	494	46	0.84	Riversdale	C06400000000049400046	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T40185/1974	Kleine Jongens Fontein	494	47	2.34	Riversdale	C06400000000049400047	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T4526/1985	Kleine Jongens Fontein	494	50	17.65	Riversdale	C06400000000049400050	Republic of South Africa	5 May 2006	Notice 596 of 2006	28797	State land released from State Forest.	13
T9051/1936	Erf 219 Stilbaai Oos.	Erf 219	0	186.75	Riversdale	C06400050000021900000	Republic of South Africa	9 December 1977	2507 of 1977	5824 of 9	State Forest Nature Reserve	42
T1673/1938	Erf 215 Stilbaai Oos	Erf 215	0	226.49	Riversdale	C06400050000021500000	Province of the Western Cape	5 October 2001	39/2001	5772	Provincial Nature Reserve	18
T8076/1937	Erf 216 Stilbaai Oos	RE/Erf 216	0	31	Riversdale	C06400050000021600000	Republic of South Africa	State land, not proclaimed, but formally managed and allocated to CapeNature by the Department of Public Works.				
Grootvadersbos Nature Reserve Cluster												
T51952/2002	Thornhill	578	0	4746.66	Riversdale	C06400000000057800000	WWF-SA	Not yet declared as nature reserve.				
Unallocated State Land	Warmwatersberg	35	0	2672.5	Swellendam	C07300000000003500000	Republic of South Africa	17 June 2005	Notice 554 of 2005	27664	State land released from State Forest.	13
T133/1947	Broom	200	0	188.19	Riversdale	C06400000000020000000	Republic of South Africa	18 March1992	22/1992	4743	Provincial Nature Reserve	27
Unallocated State Land	Palmiet *	201	0	8.88	Riversdale	C06400000000020100000	Republic of South Africa	Unallocated State Land, not proclaimed, but informally managed by CapeNature.				

*Further action is required to address the registration and reservation of these identified land parcels.

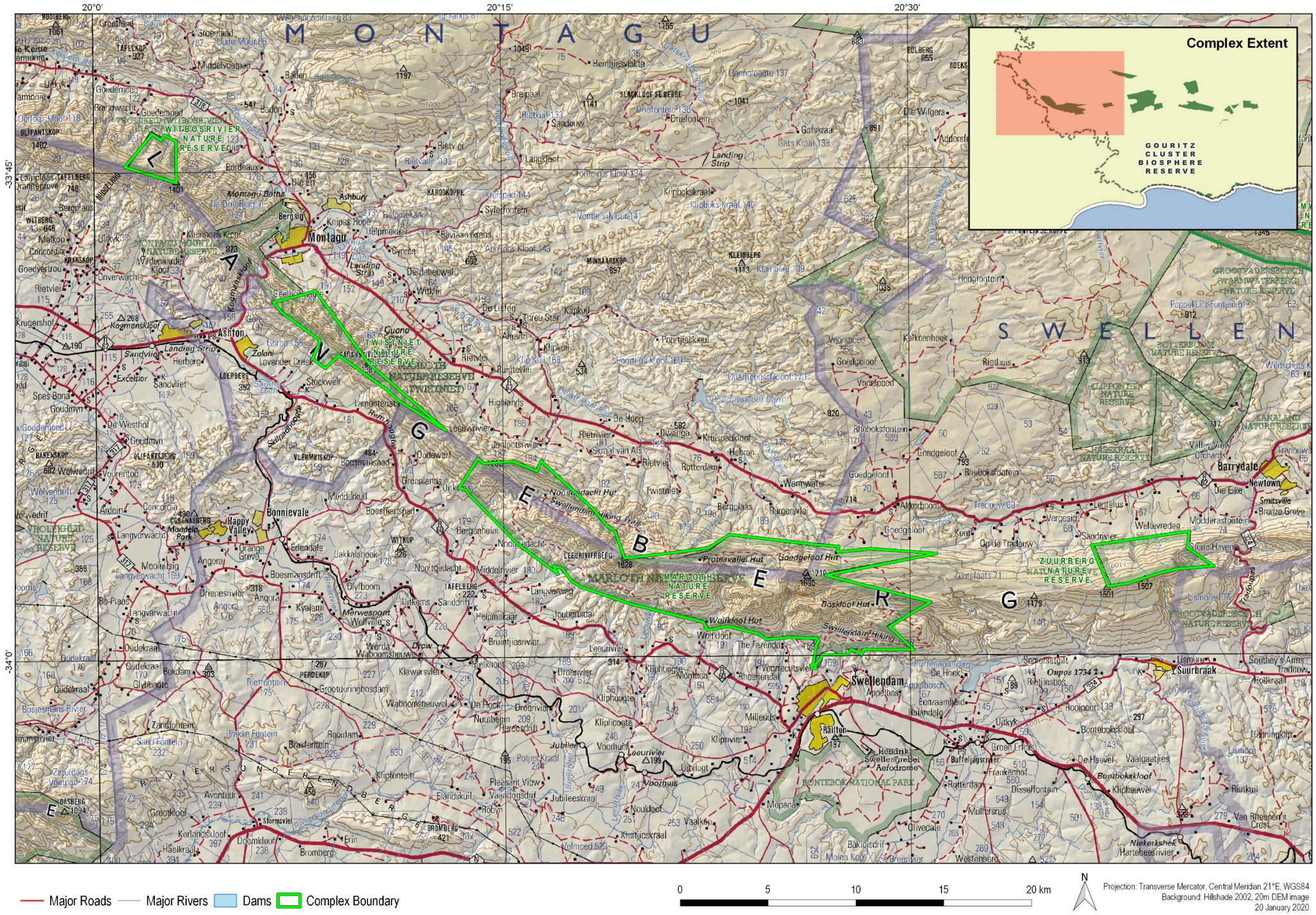
In the tables above, all state land released from state forest needs to be reserved for the Western Cape Government to be declared as provincial nature reserves.

APPENDIX 2 Maps of the Langeberg Complex

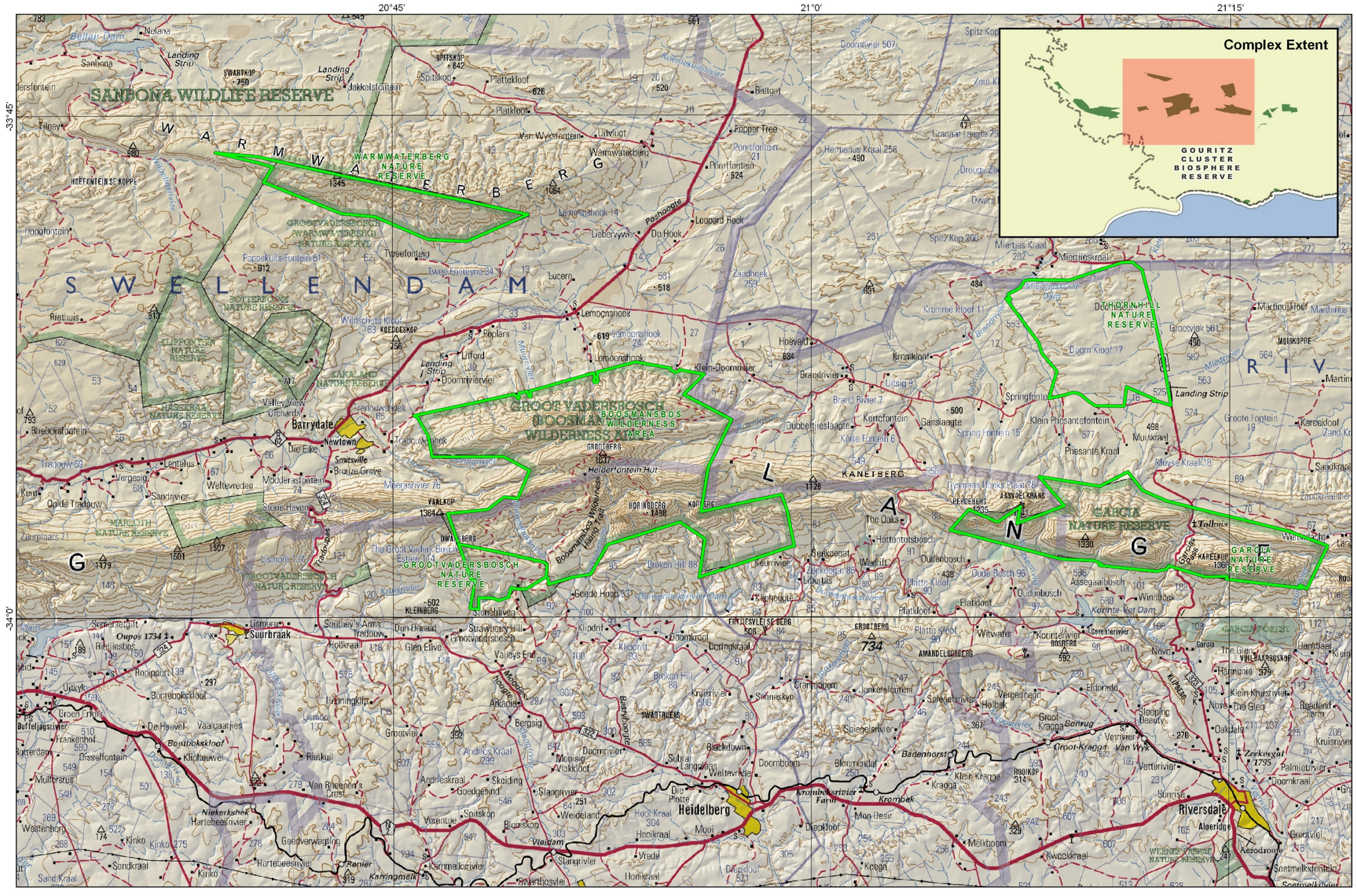
Map 1: Location and extent of the Langeberg Complex.



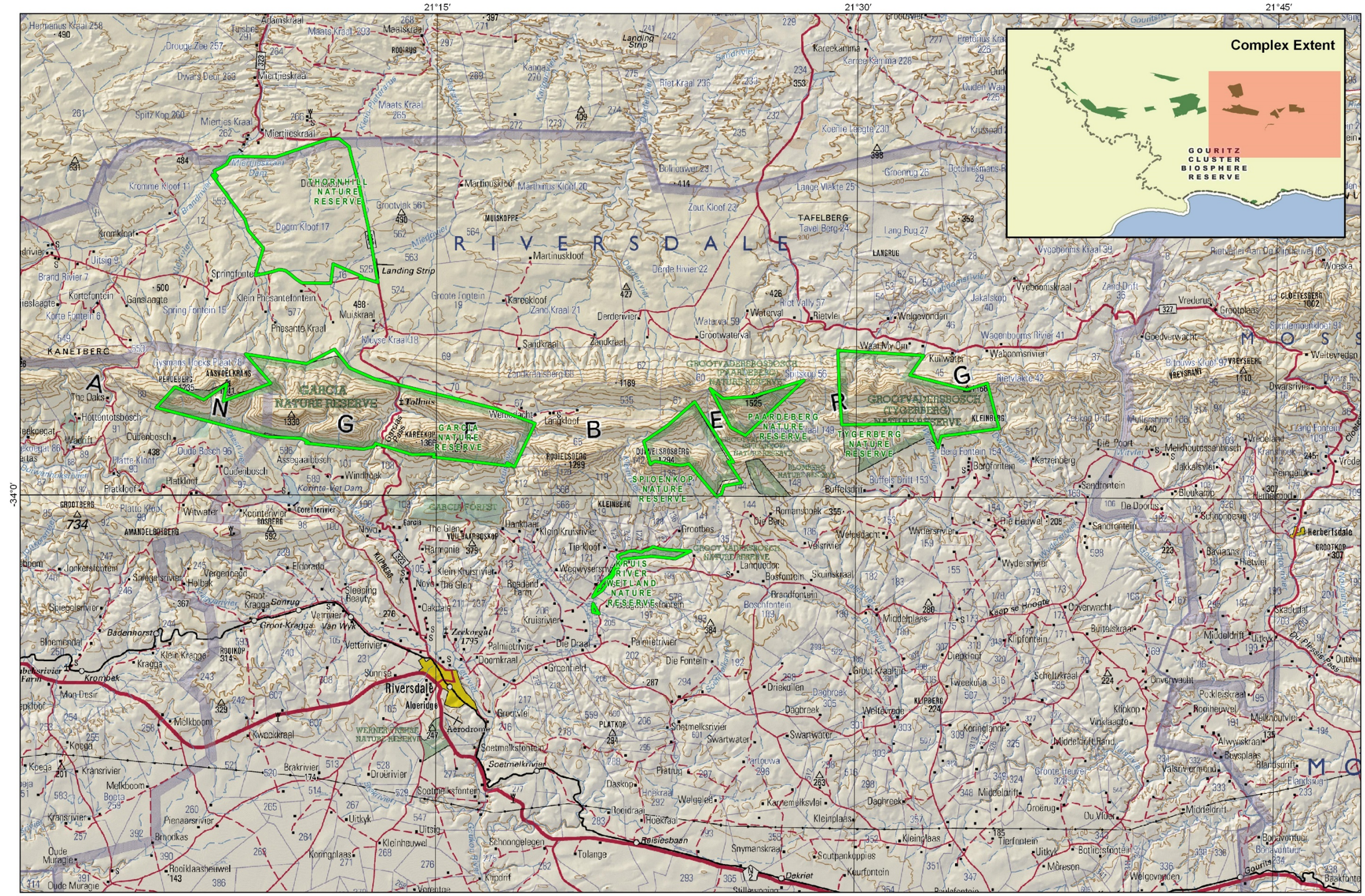
Map 2a: Topography of the Marloth Nature Reserve Cluster in the Langeberg Complex.



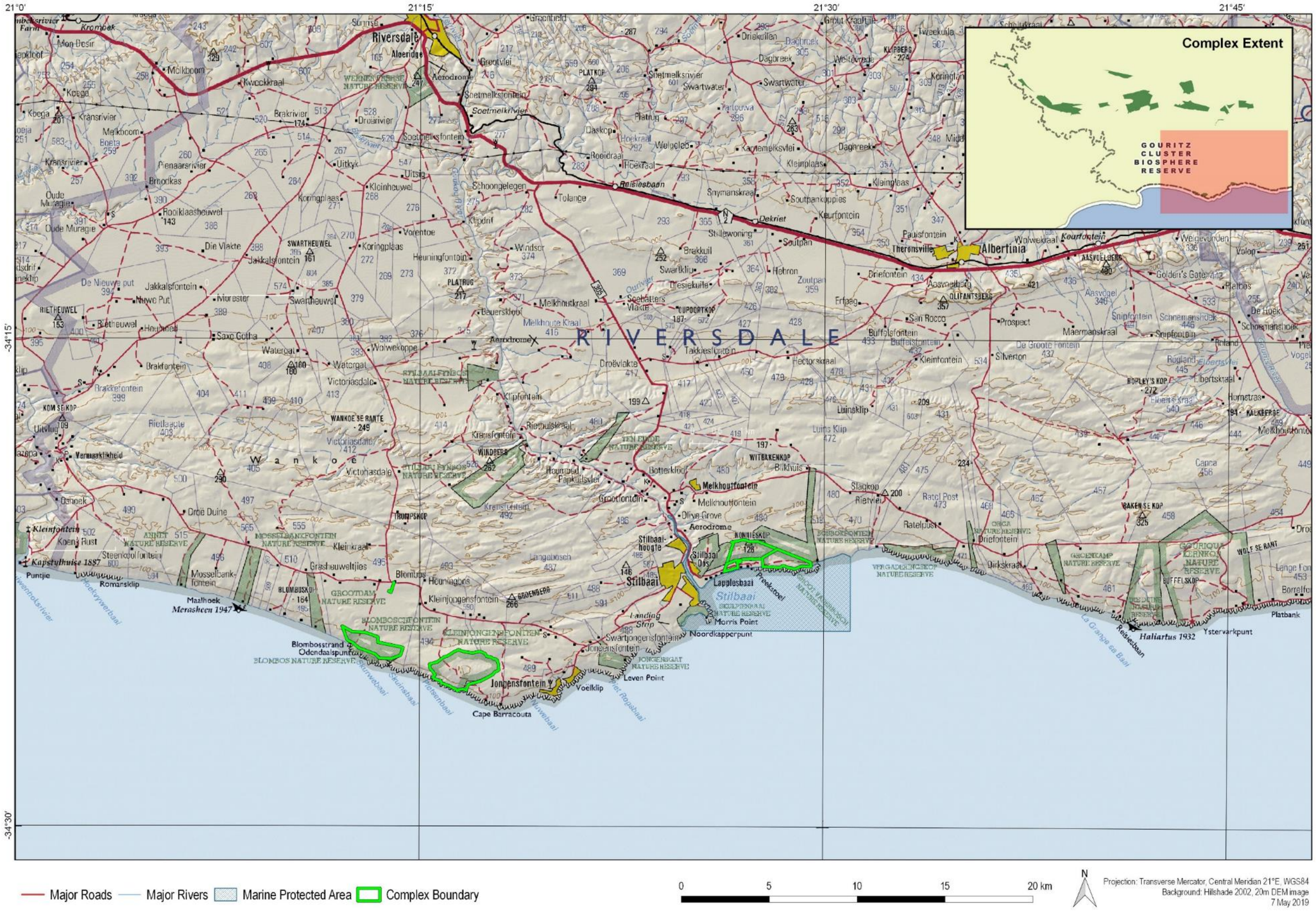
Map 2b: Topography of the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



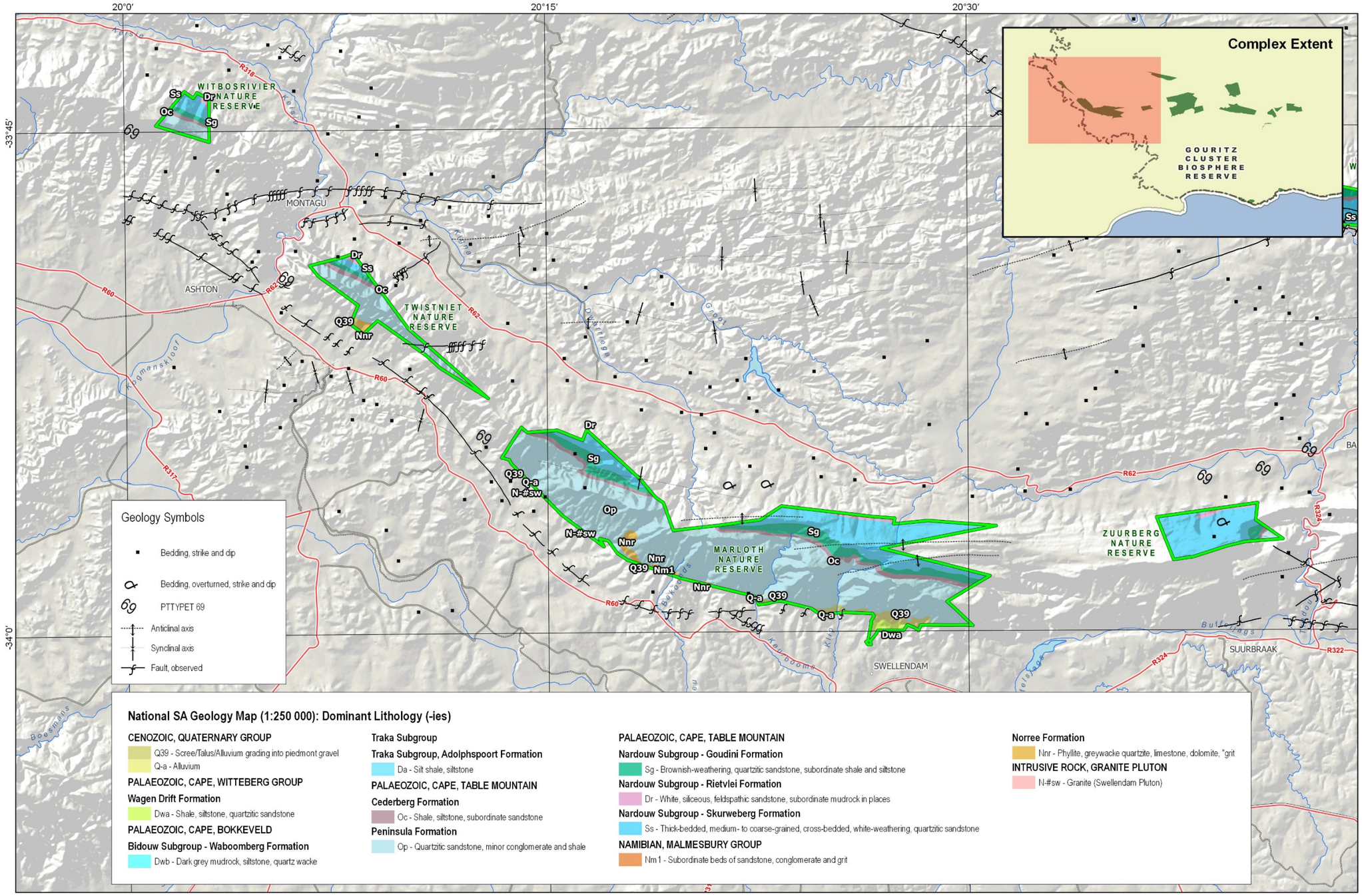
Map 2c: Topography of the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



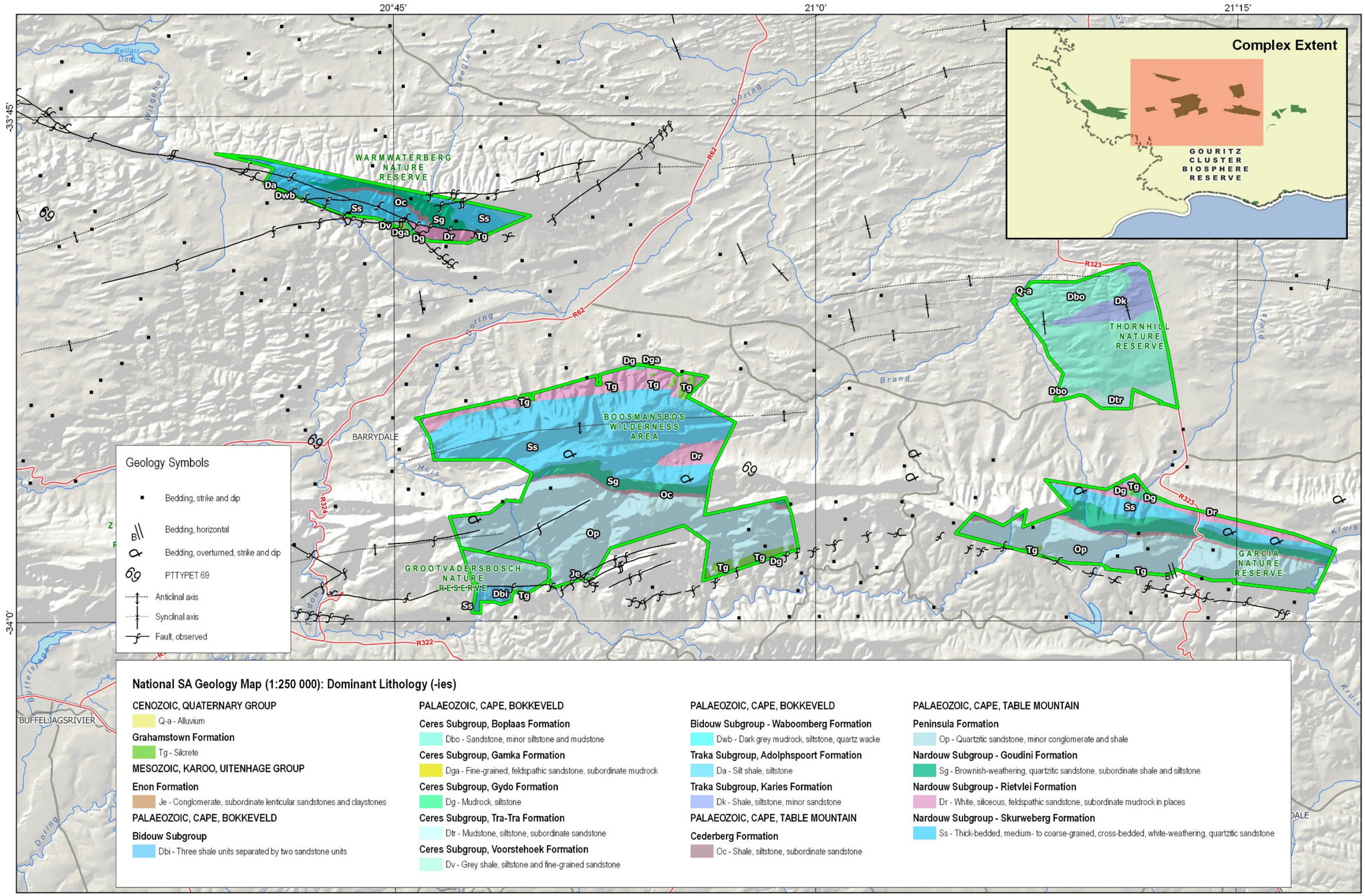
Map 2d: Topography of the Geelkrans Nature Reserve Cluster in the Langeberg Complex.



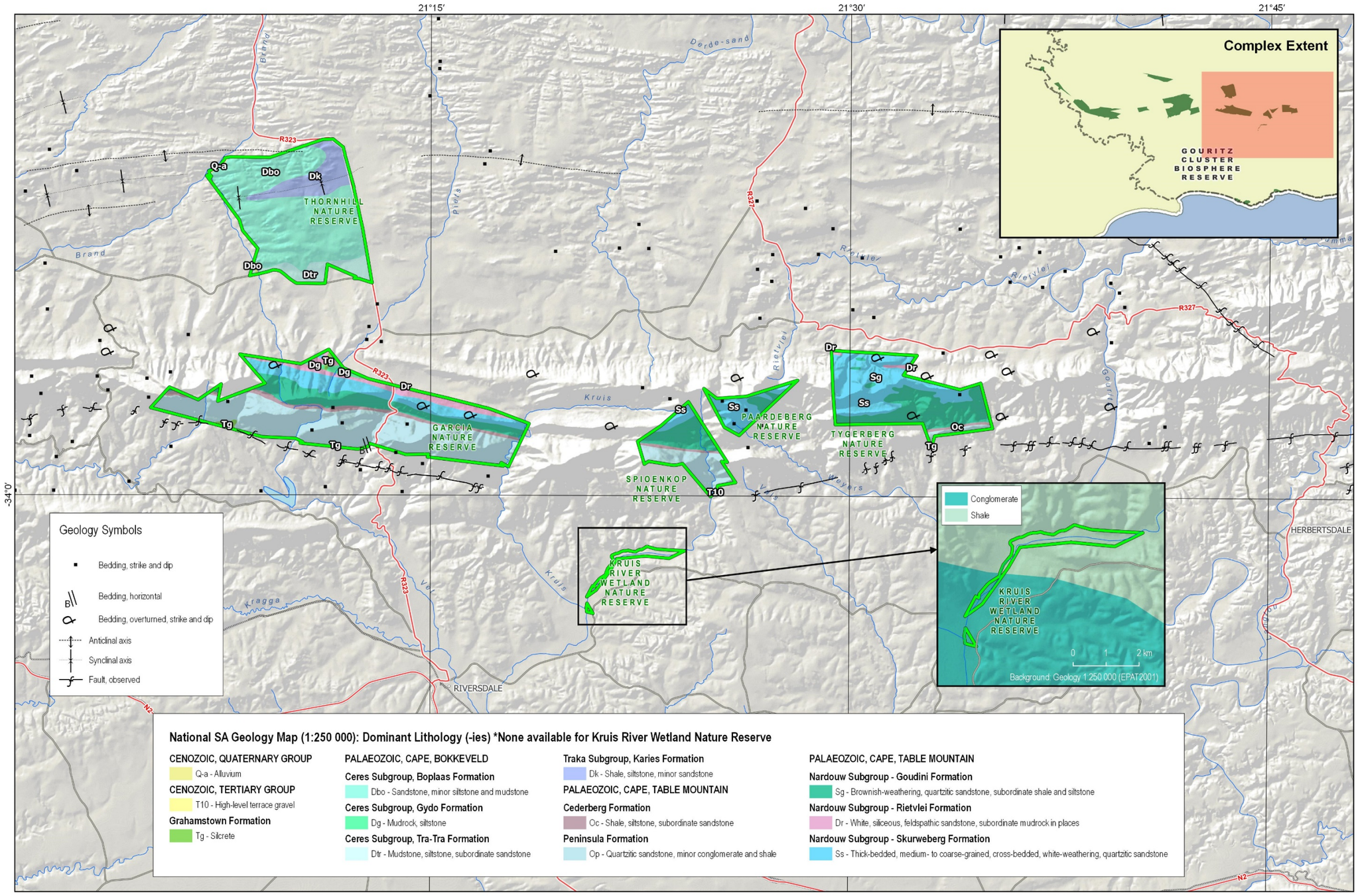
Map 3a: Geology of the Marloth Nature Reserve Cluster in the Langeberg Complex.



Map 3b: Geology of the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



Map 3c: Geology of the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



National SA Geology Map (1:250 000): Dominant Lithology (-ies) *None available for Kruis River Wetland Nature Reserve

CENOZOIC, QUATERNARY GROUP
- Q-a - Alluvium

CENOZOIC, TERTIARY GROUP
- T10 - High-level terrace gravel

Grahamstown Formation
- Tg - Silcrete

PALAEOZOIC, CAPE, BOKKEVELD

Ceres Subgroup, Boplaas Formation
- Dbo - Sandstone, minor siltstone and mudstone

Ceres Subgroup, Gydo Formation
- Dg - Mudrock, siltstone

Ceres Subgroup, Tra-Tra Formation
- Dtr - Mudstone, siltstone, subordinate sandstone

Traka Subgroup, Karies Formation
- Dk - Shale, siltstone, minor sandstone

PALAEOZOIC, CAPE, TABLE MOUNTAIN

Cederberg Formation
- Oc - Shale, siltstone, subordinate sandstone

Peninsula Formation
- Op - Quartzitic sandstone, minor conglomerate and shale

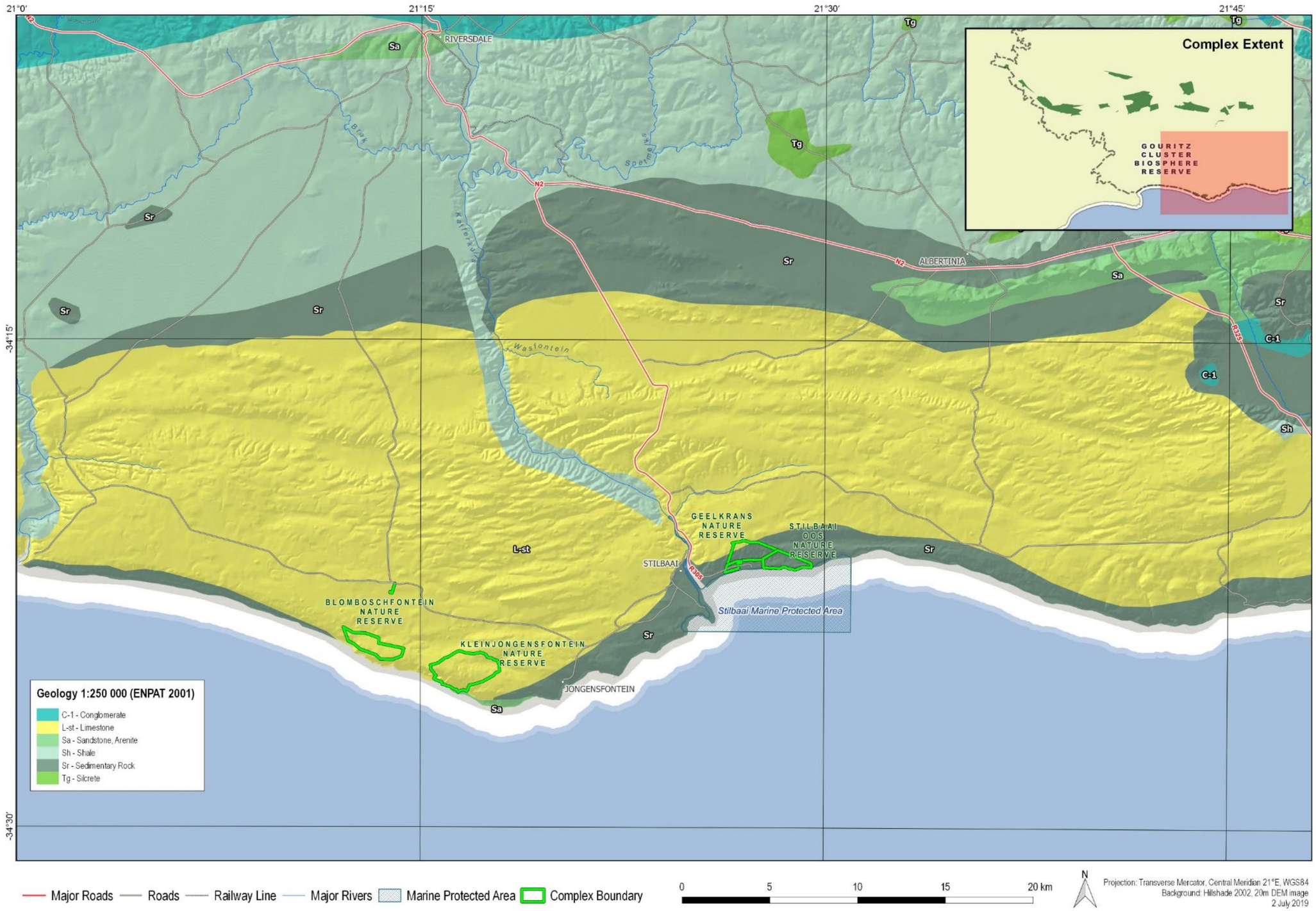
PALAEOZOIC, CAPE, TABLE MOUNTAIN

Nardouw Subgroup - Goudini Formation
- Sg - Brownish-weathering, quartzitic sandstone, subordinate shale and siltstone

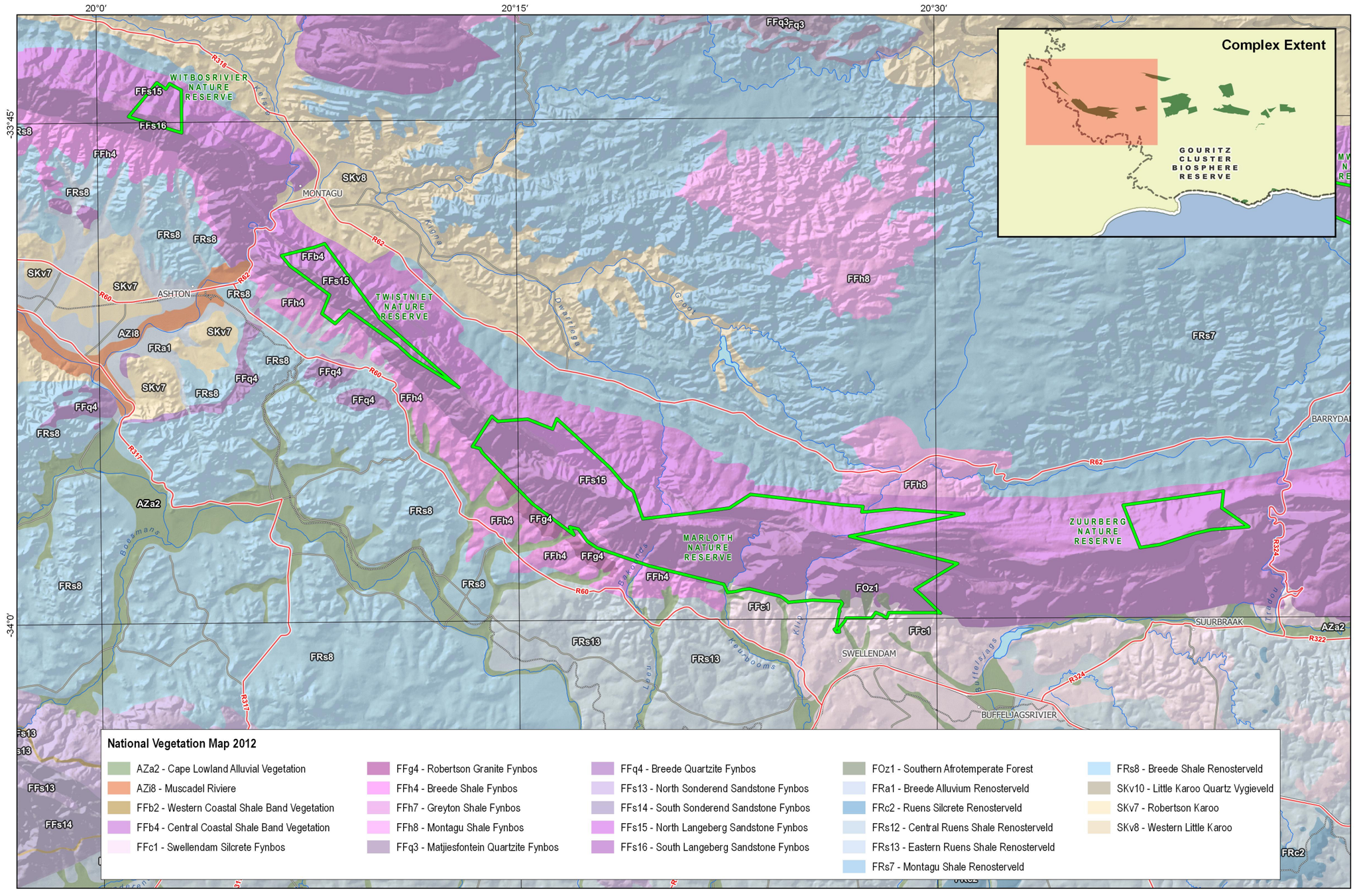
Nardouw Subgroup - Rietvlei Formation
- Dr - White, siliceous, feldspathic sandstone, subordinate mudrock in places

Nardouw Subgroup - Skurweberg Formation
- Ss - Thick-bedded, medium- to coarse-grained, cross-bedded, white-weathering, quartzitic sandstone

Map 3d: Geology of the Geelkrans Nature Reserve Cluster in the Langeberg Complex.



Map 4a: Vegetation of the Marloth Nature Reserve Cluster in the Langeberg Complex.



National Vegetation Map 2012

- AZa2 - Cape Lowland Alluvial Vegetation
- AZi8 - Muscadel Riviere
- FFb2 - Western Coastal Shale Band Vegetation
- FFb4 - Central Coastal Shale Band Vegetation
- FFc1 - Swellendam Silcrete Fynbos
- FFg4 - Robertson Granite Fynbos
- FFh4 - Breede Shale Fynbos
- FFh7 - Greyton Shale Fynbos
- FFh8 - Montagu Shale Fynbos
- FFq3 - Matjiesfontein Quartzite Fynbos
- FFq4 - Breede Quartzite Fynbos
- FFs13 - North Sonderend Sandstone Fynbos
- FFs14 - South Sonderend Sandstone Fynbos
- FFs15 - North Langeberg Sandstone Fynbos
- FFs16 - South Langeberg Sandstone Fynbos
- FOz1 - Southern Afrotemperate Forest
- FRa1 - Breede Alluvium Renosterveld
- FRc2 - Ruens Silcrete Renosterveld
- FRs12 - Central Ruens Shale Renosterveld
- FRs13 - Eastern Ruens Shale Renosterveld
- FRs7 - Montagu Shale Renosterveld
- FRs8 - Breede Shale Renosterveld
- SKv10 - Little Karoo Quartz Vygieveld
- SKv7 - Robertson Karoo
- SKv8 - Western Little Karoo

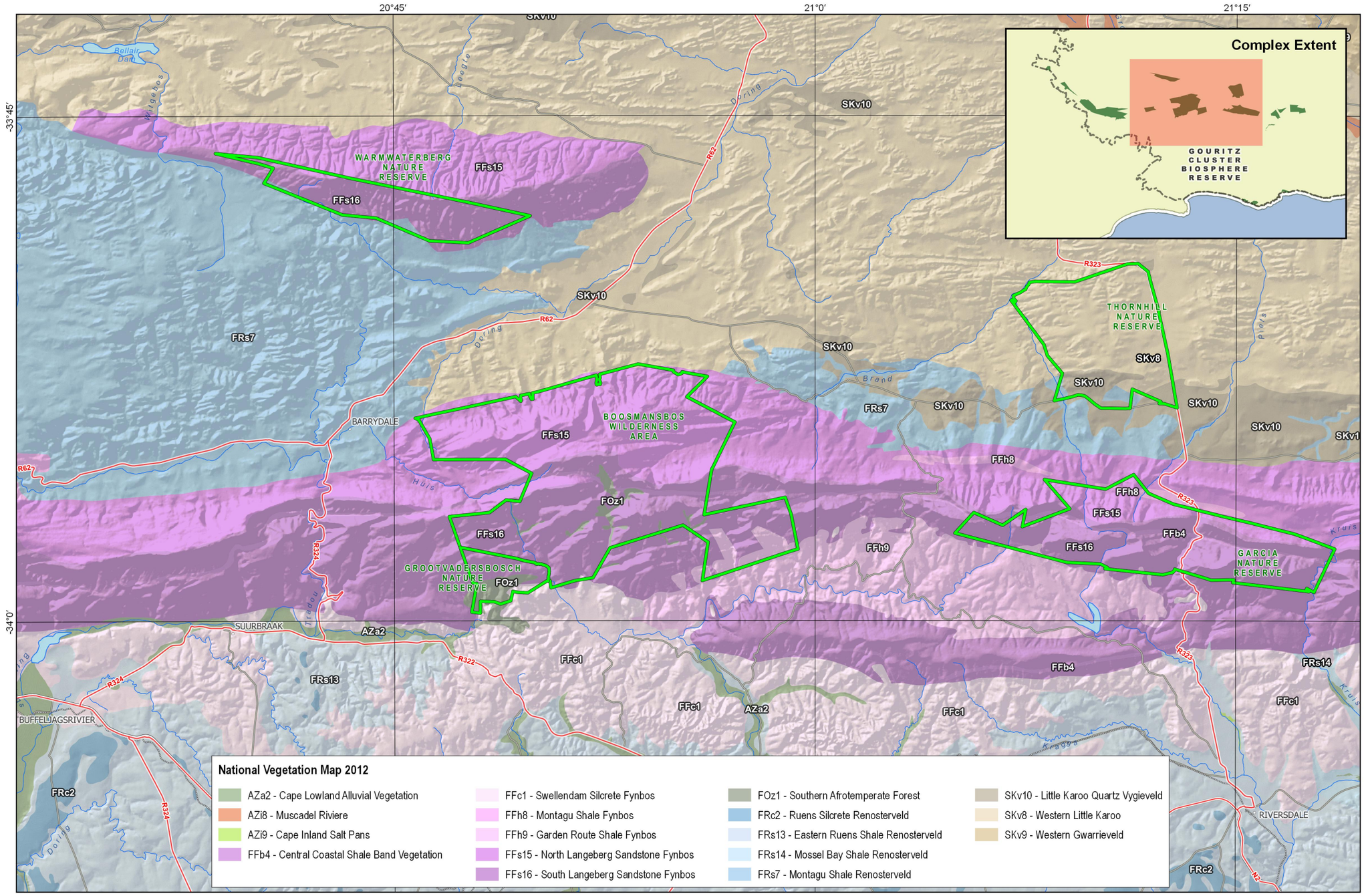
Major Roads — Roads — Railway Line — Major Rivers — Dams — Complex Boundary

0 5 10 15 20 km

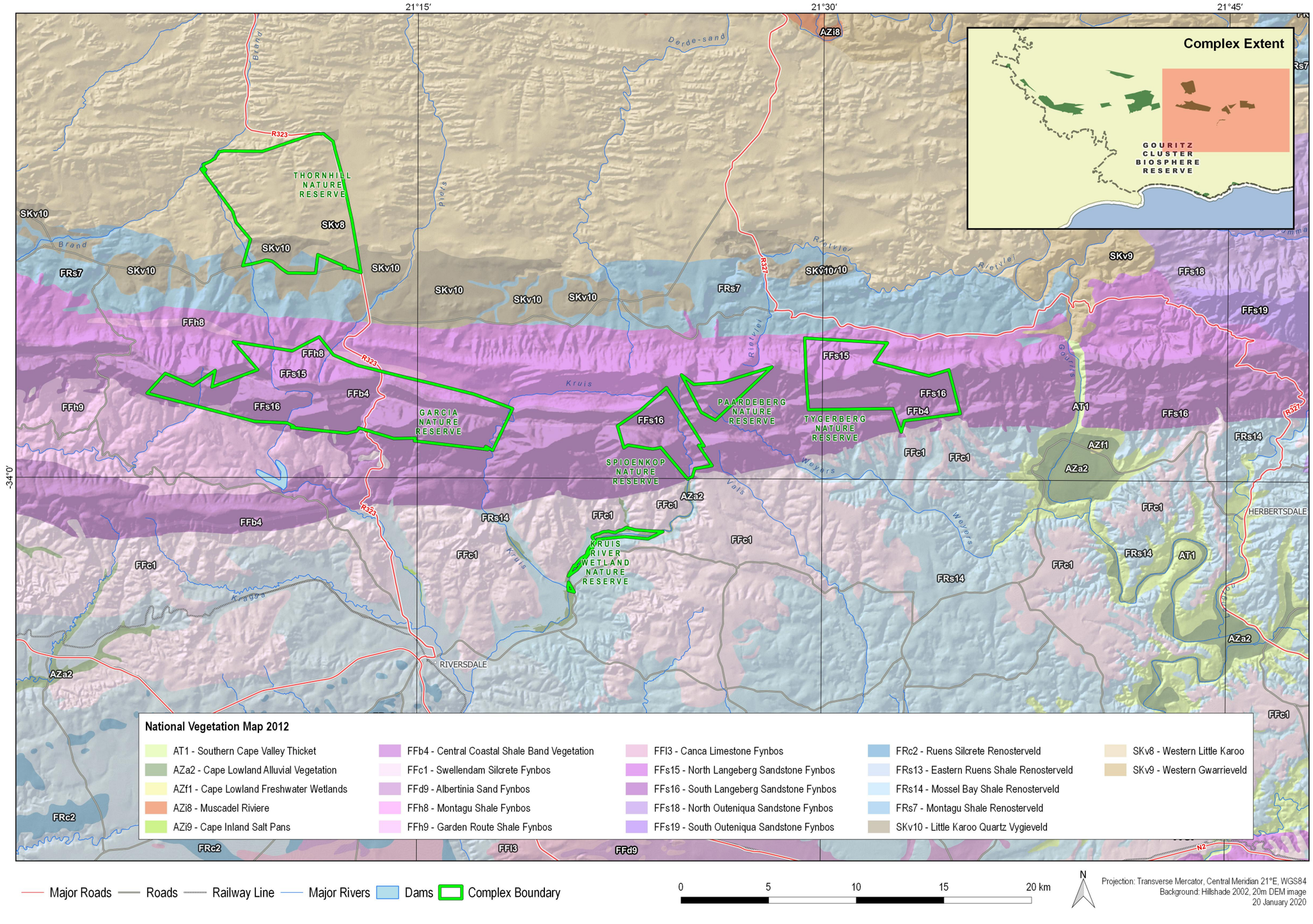
N

Projection: Transverse Mercator, Central Meridian 21°E, WGS84
Background: Hillshade 2002, 20m DEM image
20 January 2020

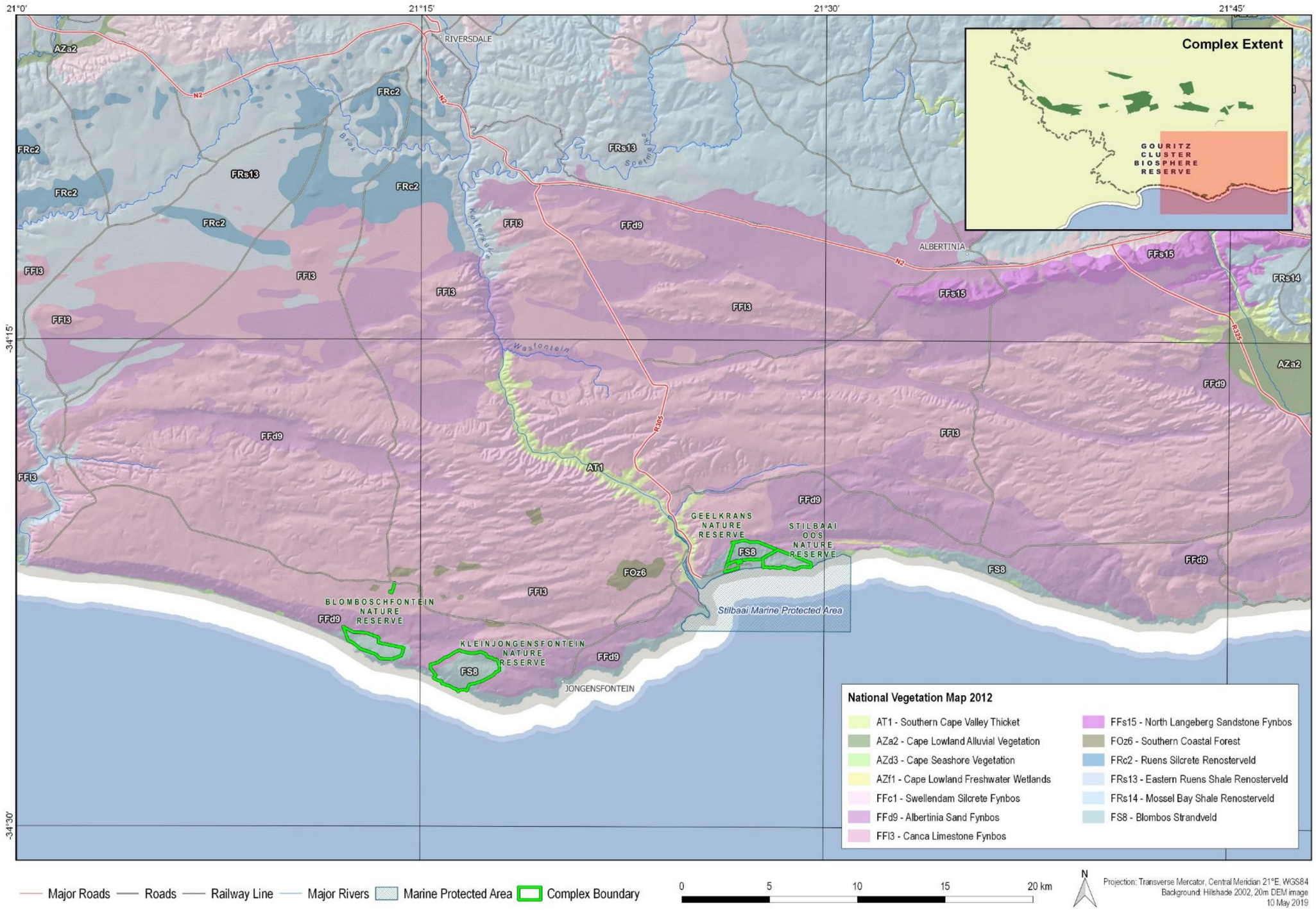
Map 4b: Vegetation of the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



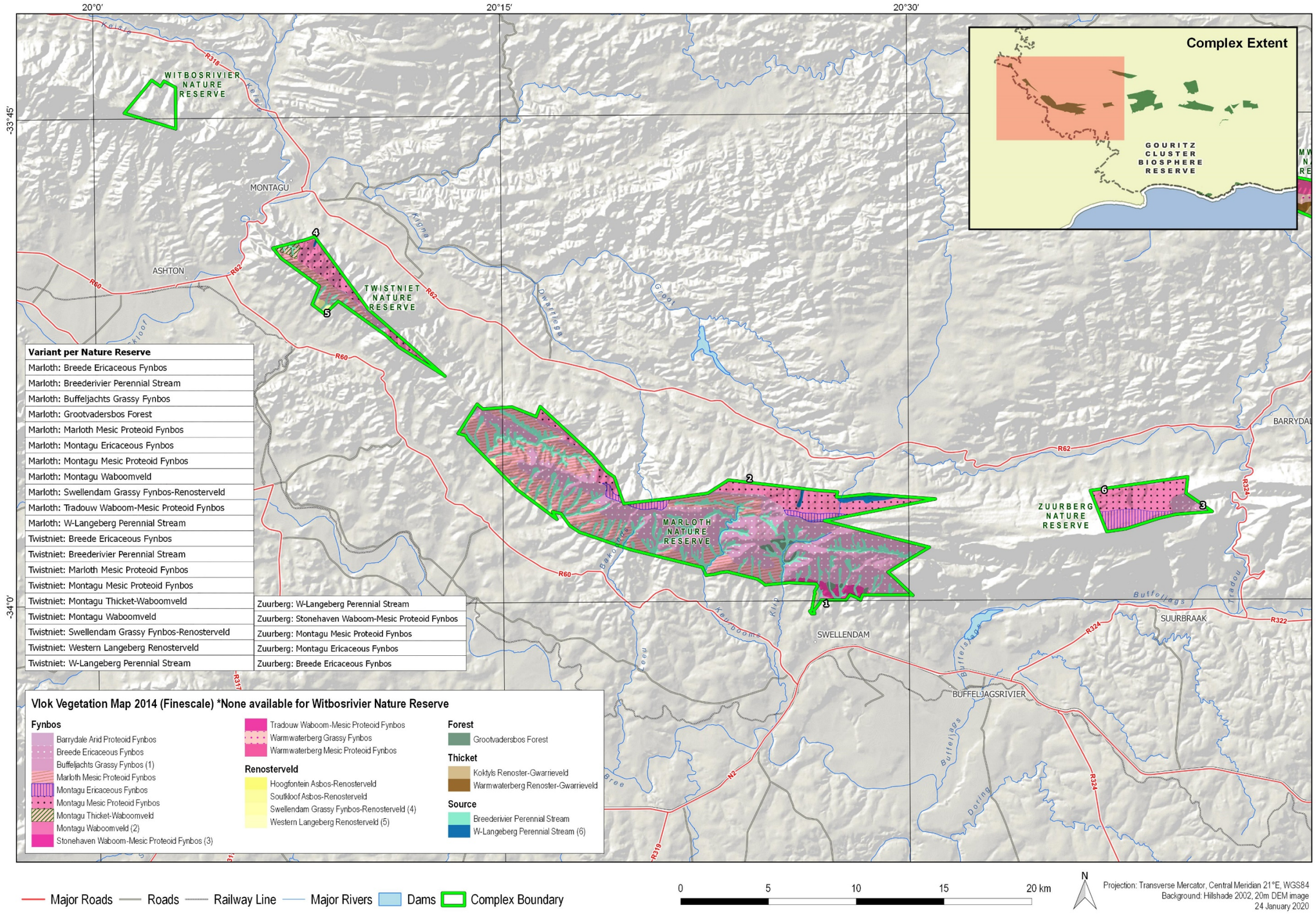
Map 4c: Vegetation of the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



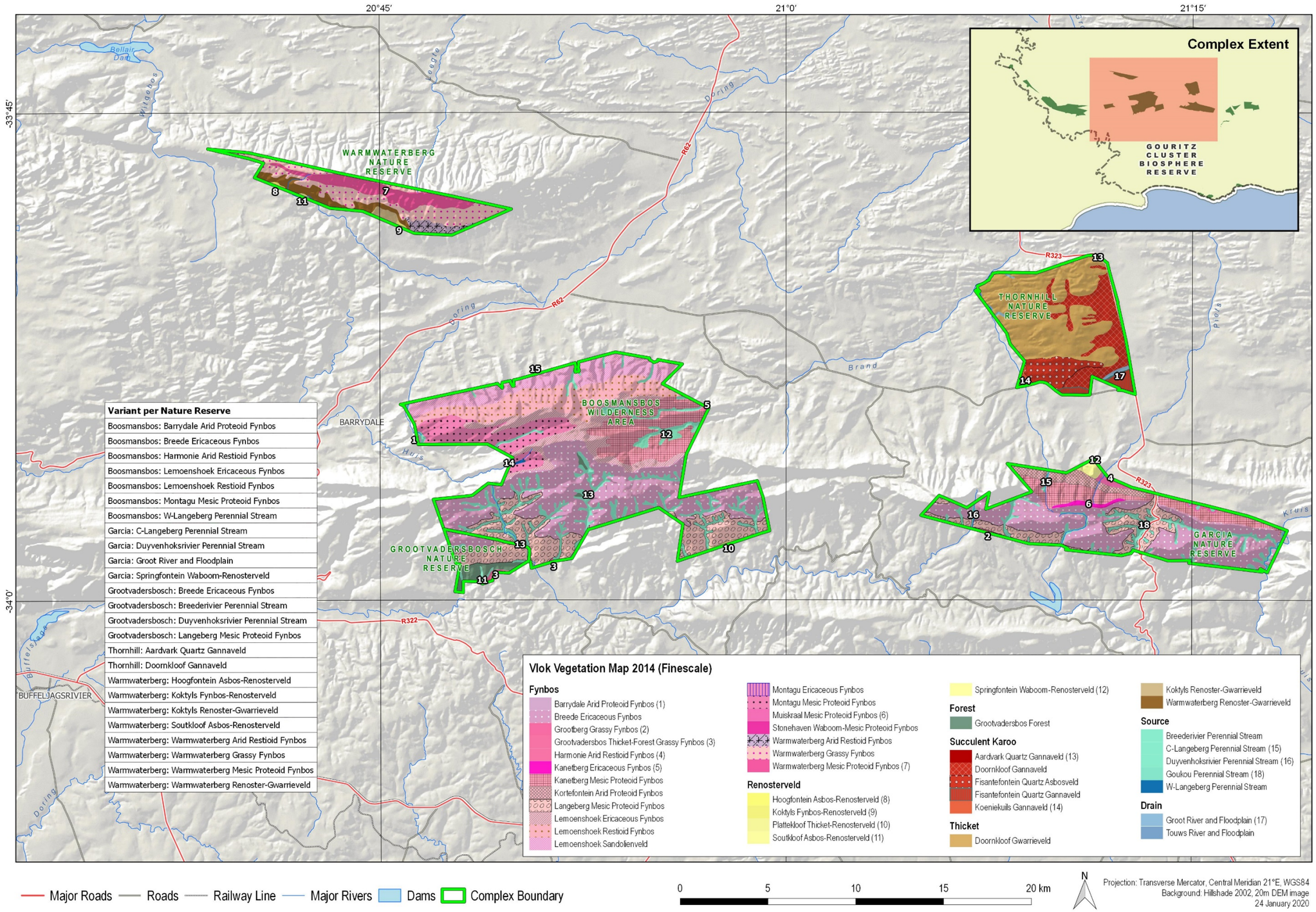
Map 4d: Vegetation of the Geelkrans Nature Reserve Cluster in the Langeberg Complex.



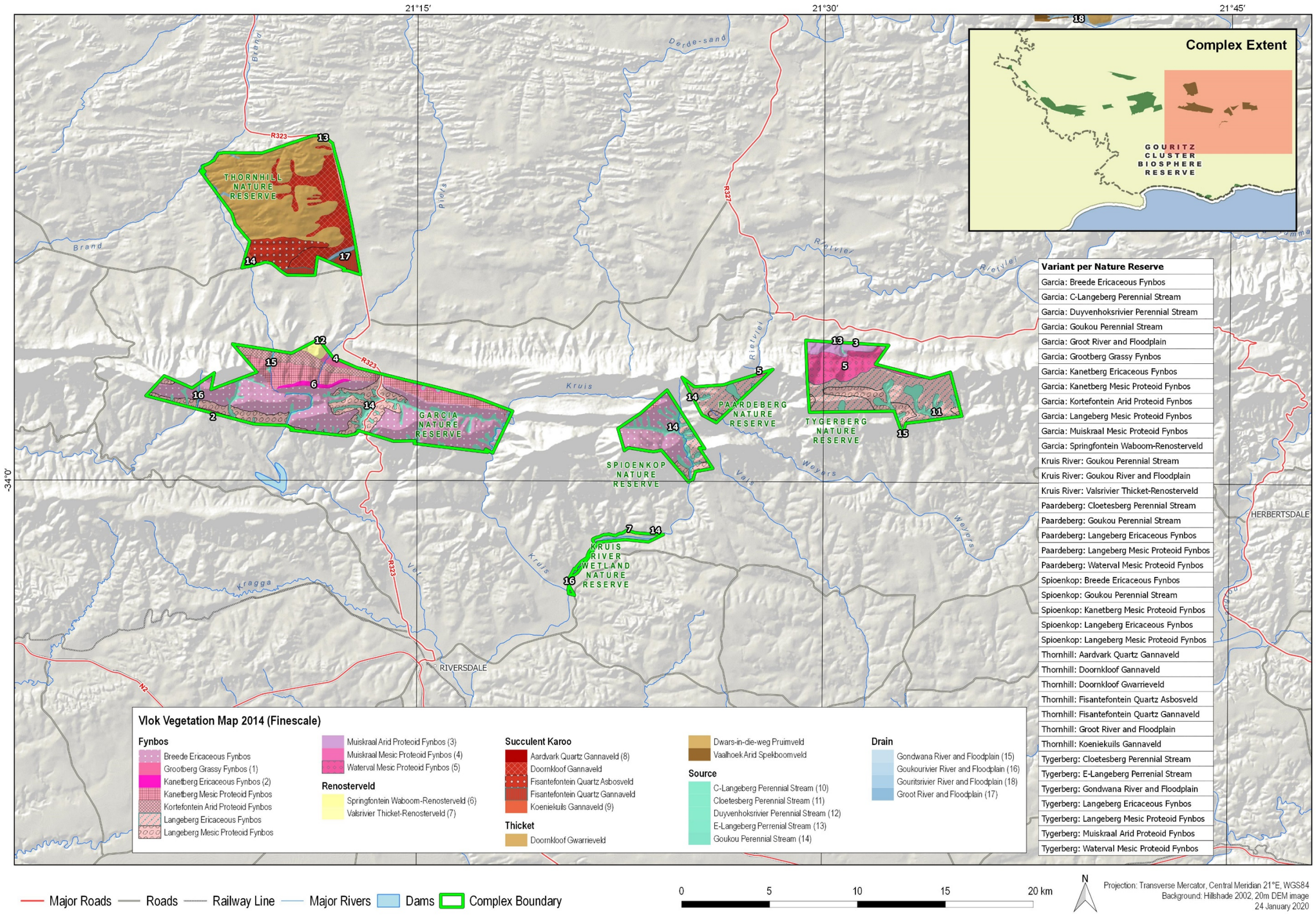
Map 5a: Fine scale vegetation map of the Marloth Nature Reserve Cluster in the Langeberg Complex. Based on Vlok et al. 2005 and Vlok and de Villiers 2007.



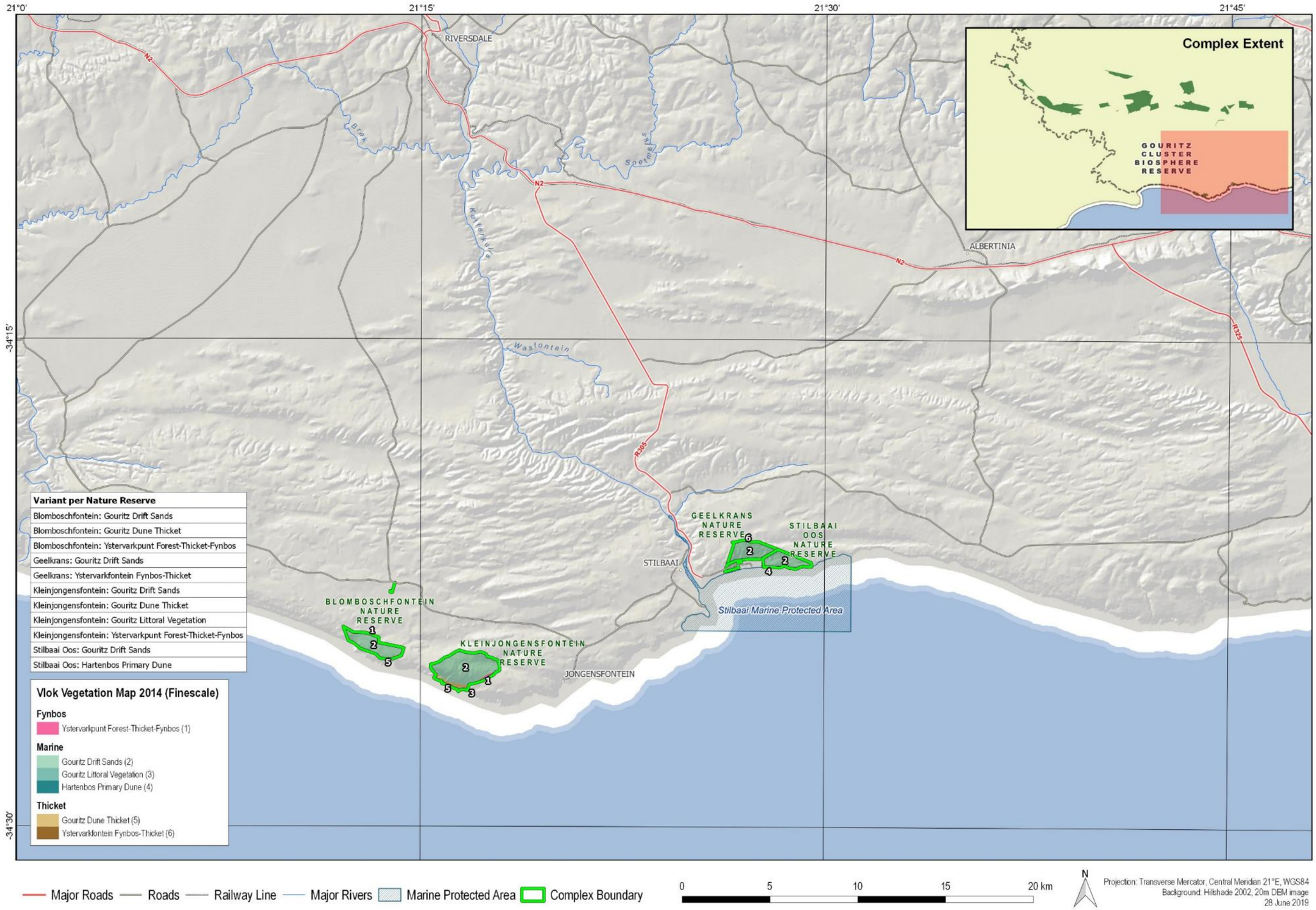
Map 5b: Fine scale vegetation map of the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex. Based on Vlok et al. 2005 and Vlok and de Villiers 2007.



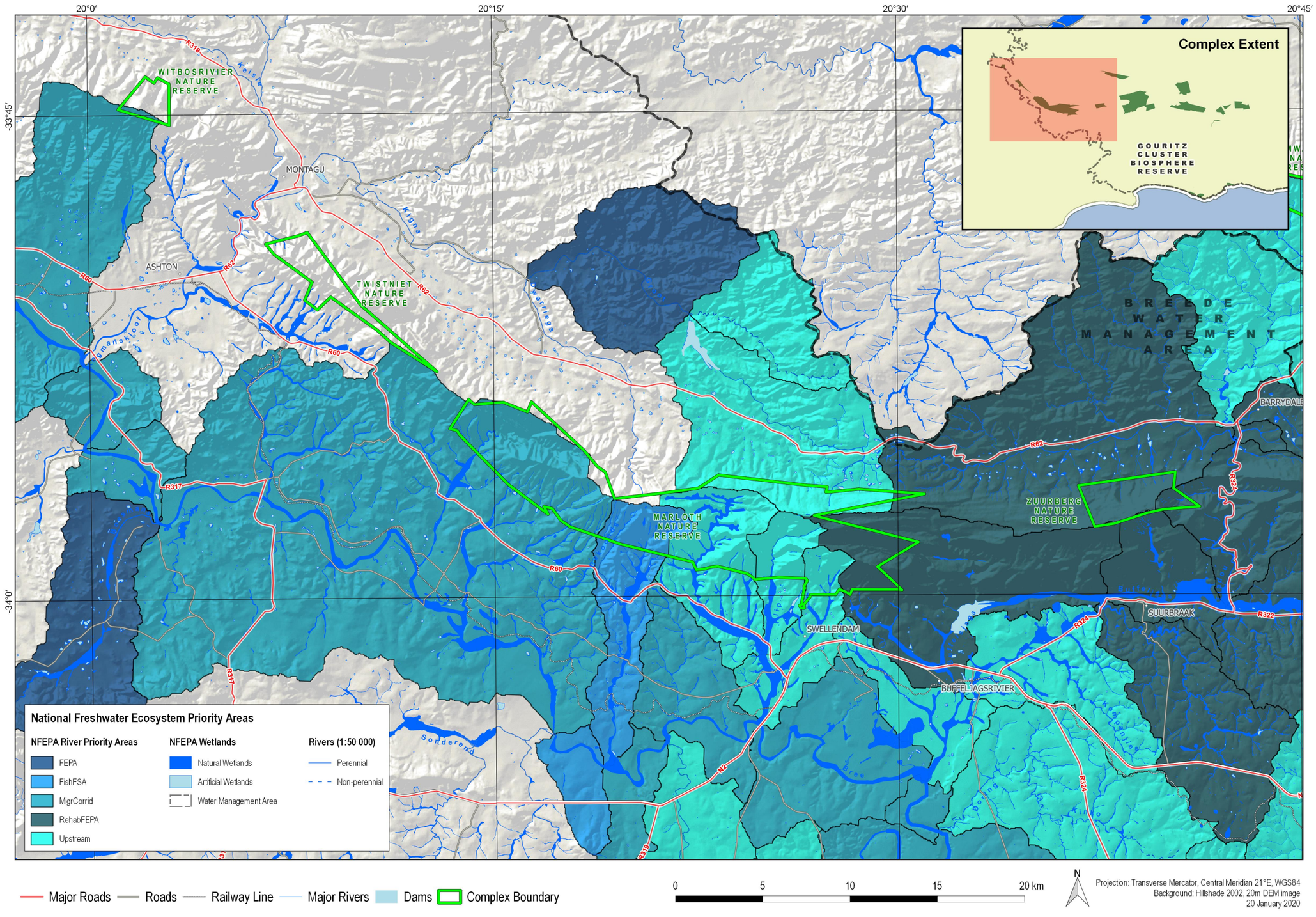
Map 5c: Fine scale vegetation map of the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex. Based on Vlok et al. 2005 and Vlok and de Villiers 2007.



Map 5d: Fine scale vegetation map of the Geelkrans Nature Reserve Cluster in the Langeberg Complex. Based on Vlok et al. 2005 and Vlok and de Villiers 2007.

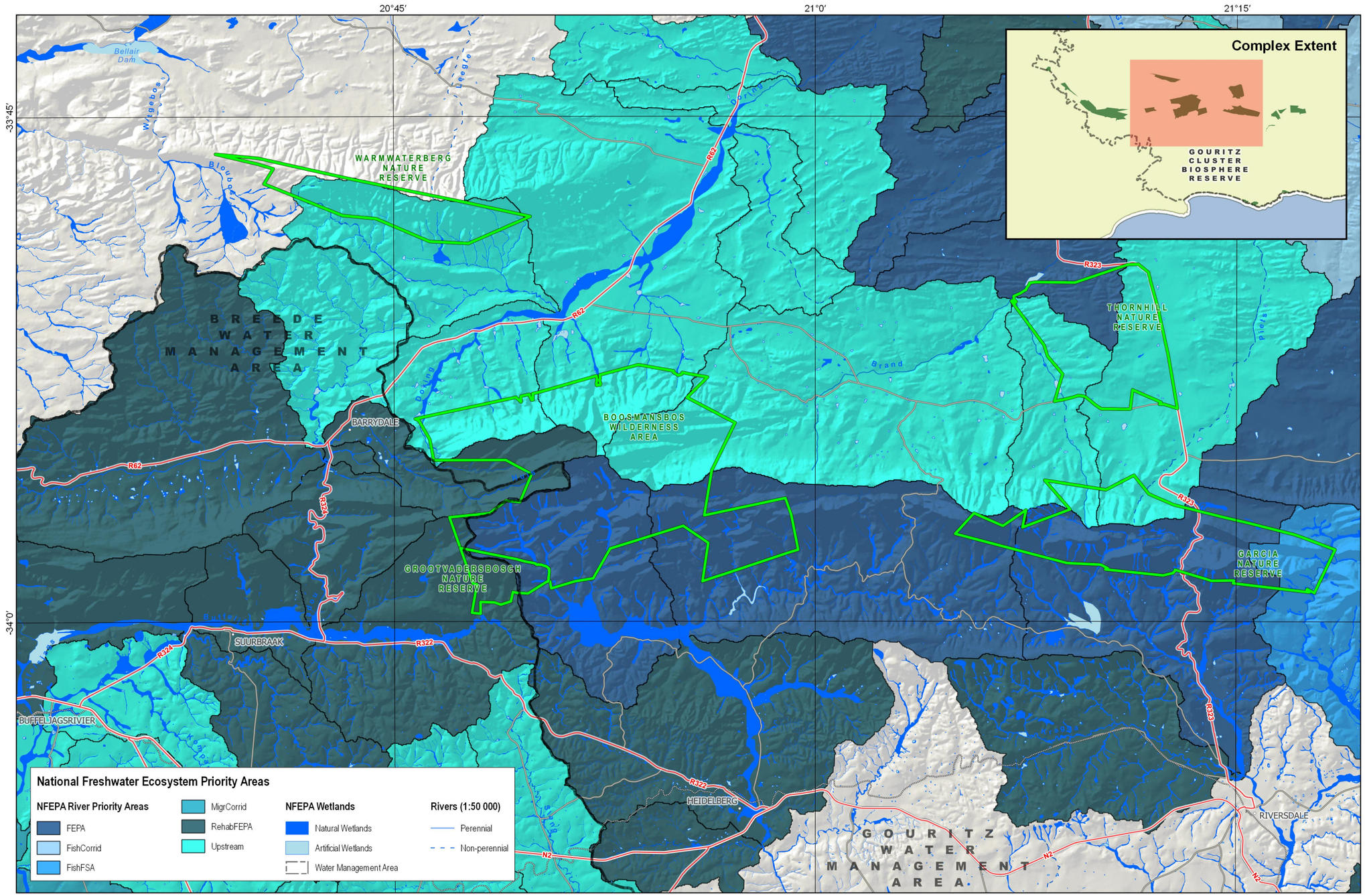


Map 6a: National Freshwater Ecosystem Priority Areas of the Marloth Nature Reserve Cluster in the Langeberg Complex.



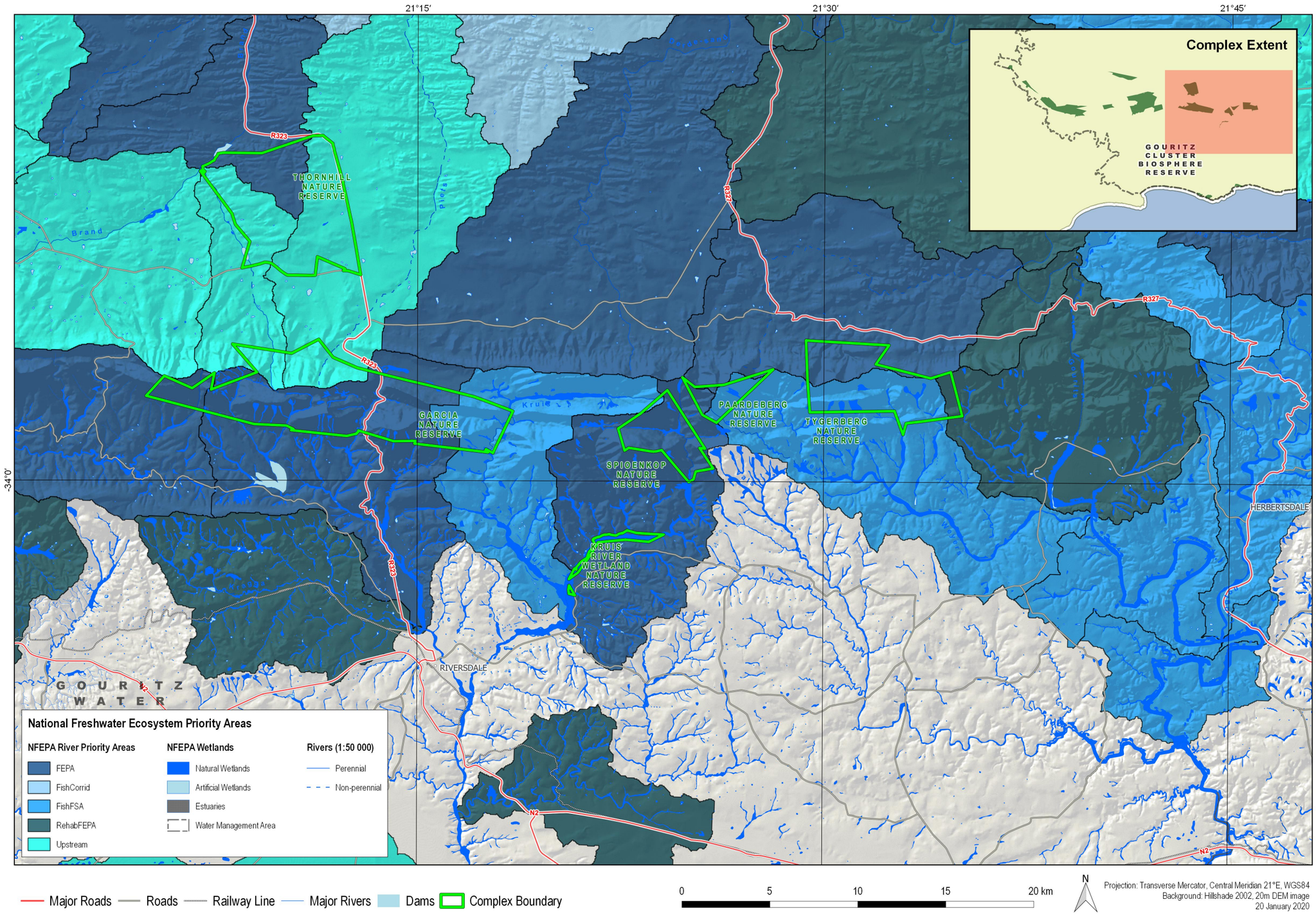
Projection: Transverse Mercator, Central Meridian 21°E, WGS84
Background: Hillshade 2002, 20m DEM image
20 January 2020

Map 6b: National Freshwater Ecosystem Priority Areas of the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.

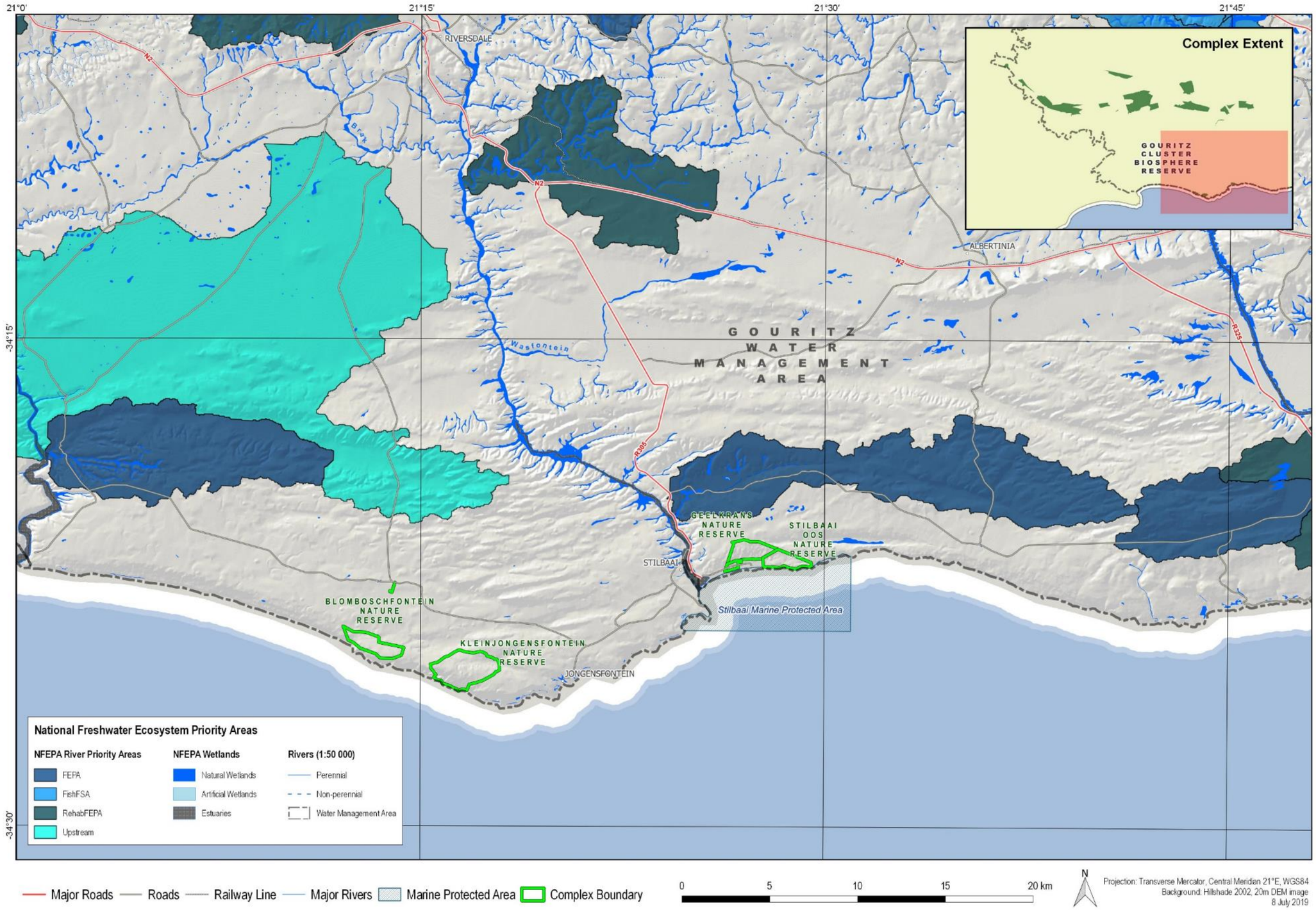


Projection: Transverse Mercator, Central Meridian 21°E, WGS84
Background: Hillshade 2002, 20m DEM image
20 January 2020

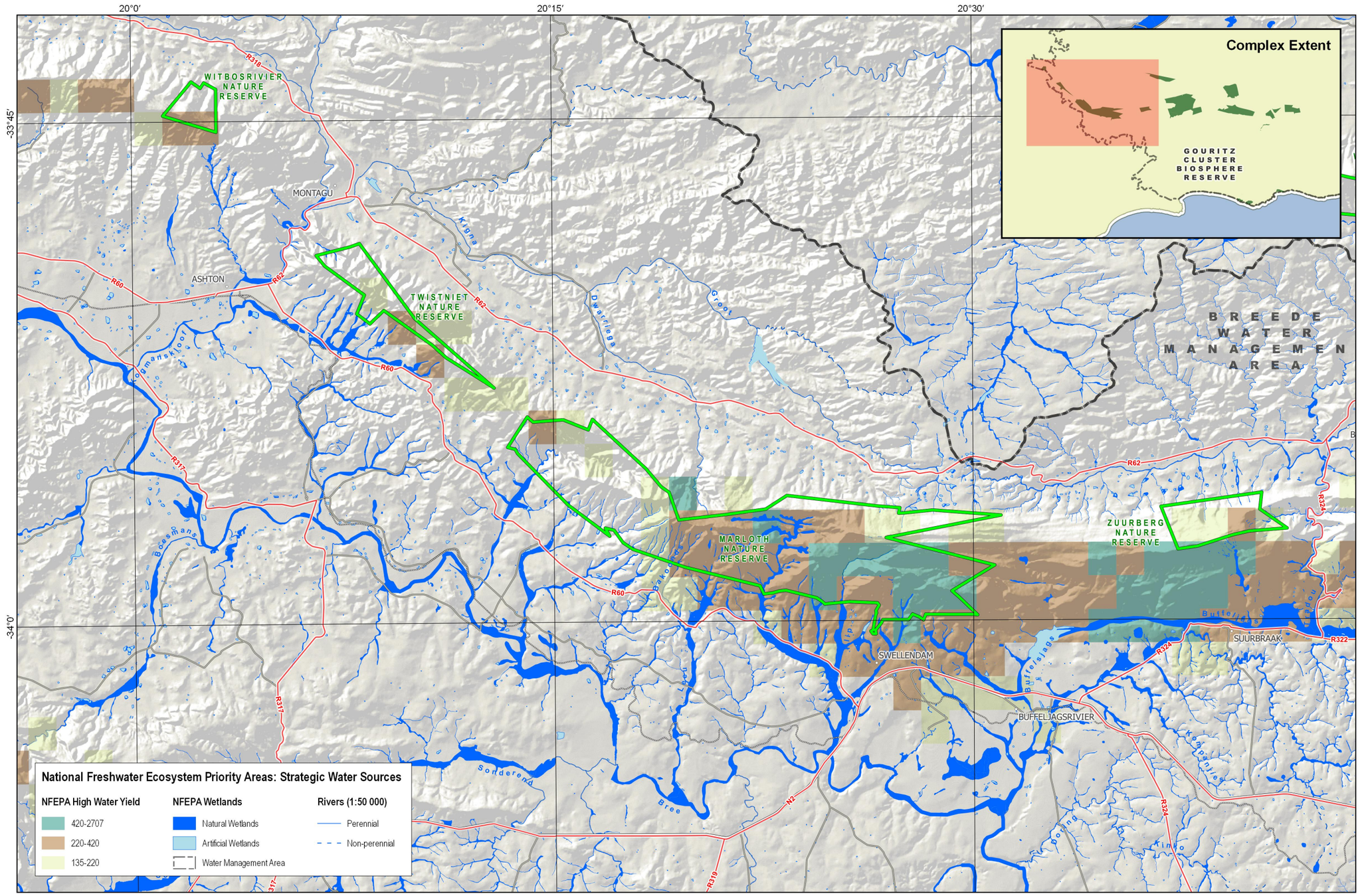
Map 6c: National Freshwater Ecosystem Priority Areas of the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



Map 6d: National Freshwater Ecosystem Priority Areas of the Geelkrans Nature Reserve Cluster in the Langeberg Complex.

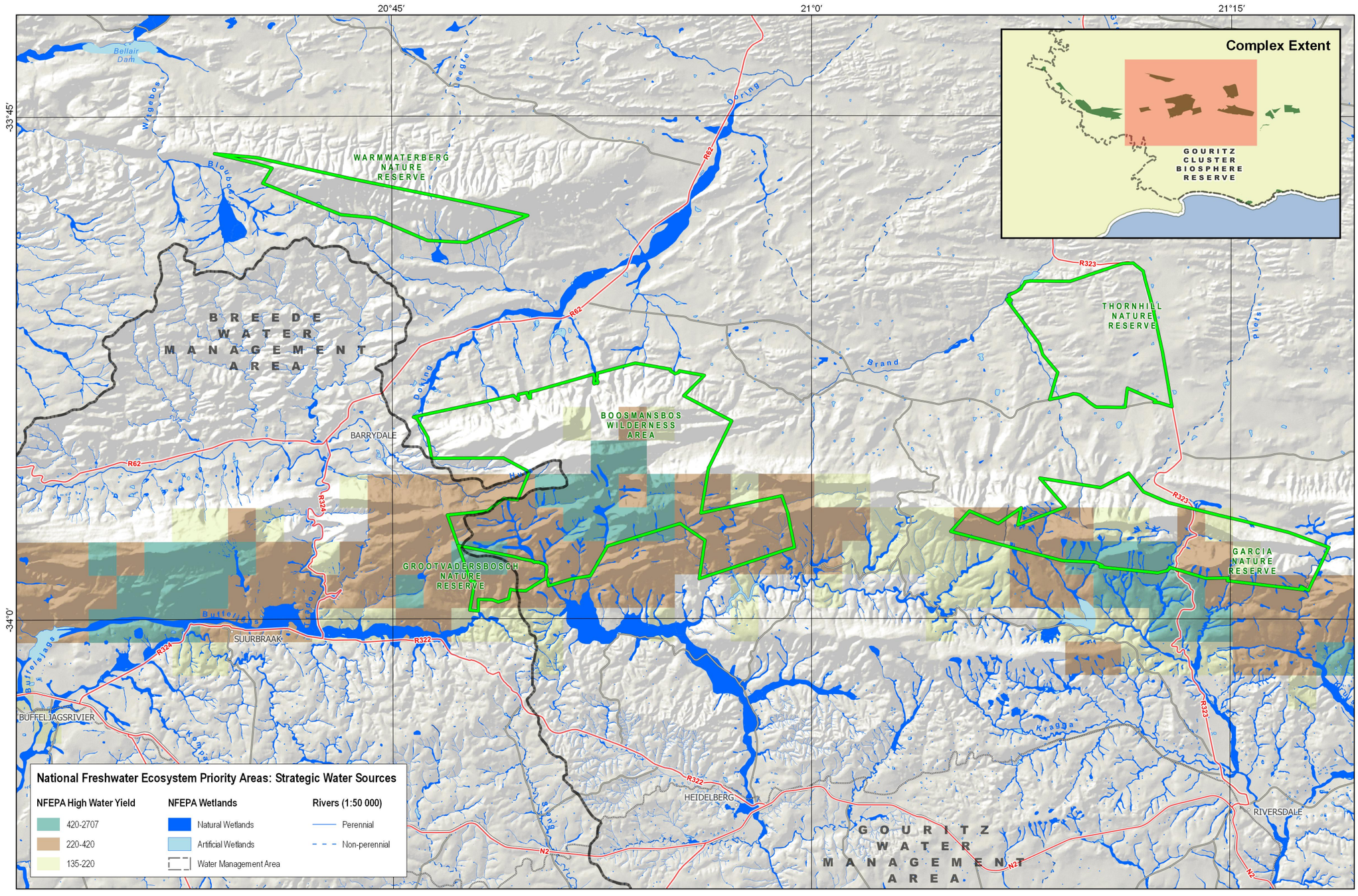


Map 7a: Aquatic systems indicating the National Strategic Water Source Area of the Marloth Nature Reserve Cluster in the Langeberg Complex.



Projection: Transverse Mercator, Central Meridian 21°E, WGS84
Background: Hillshade 2002, 20m DEM image
20 January 2020

Map 7b: Aquatic systems indicating the National Strategic Water Source Area of the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



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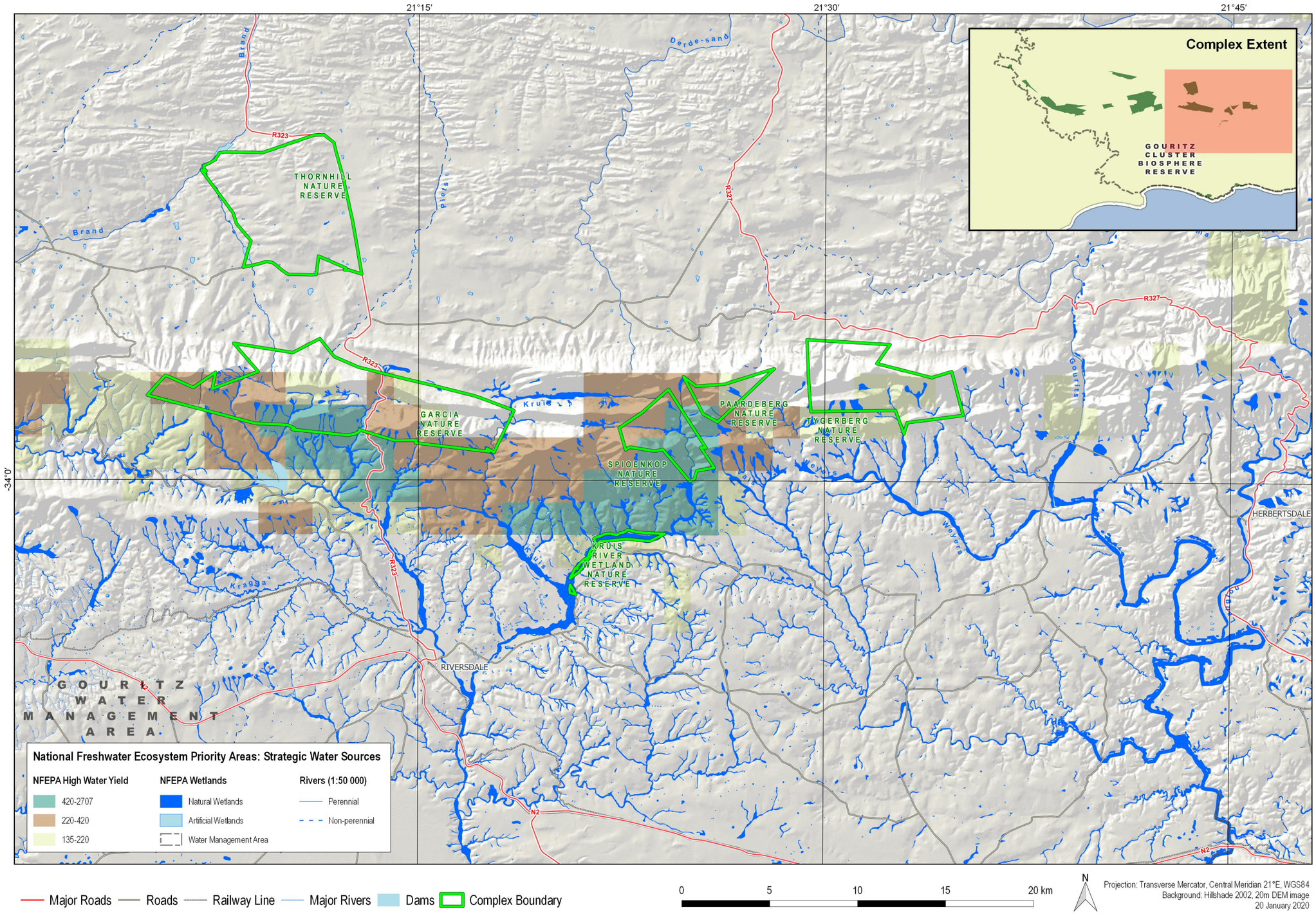

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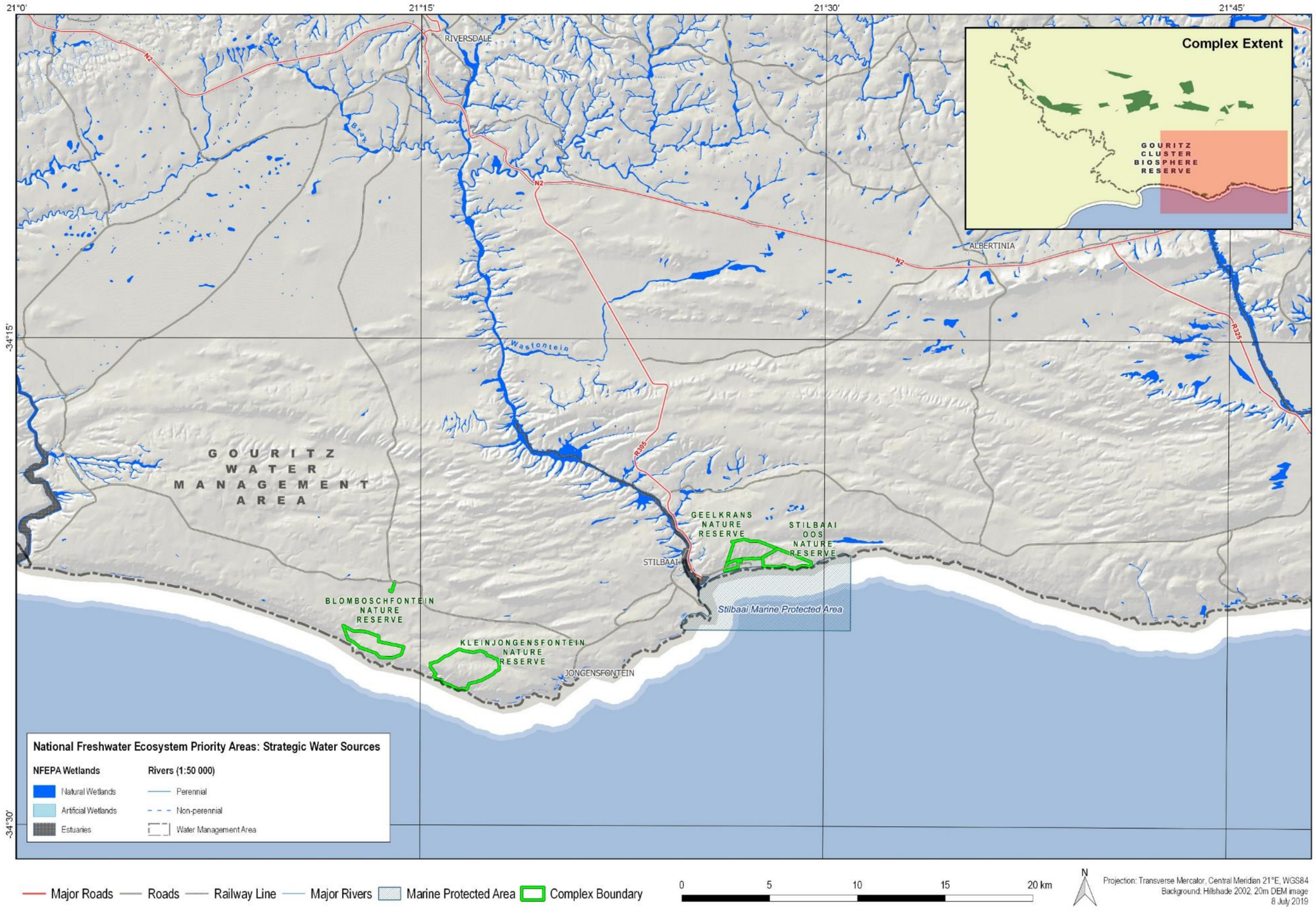
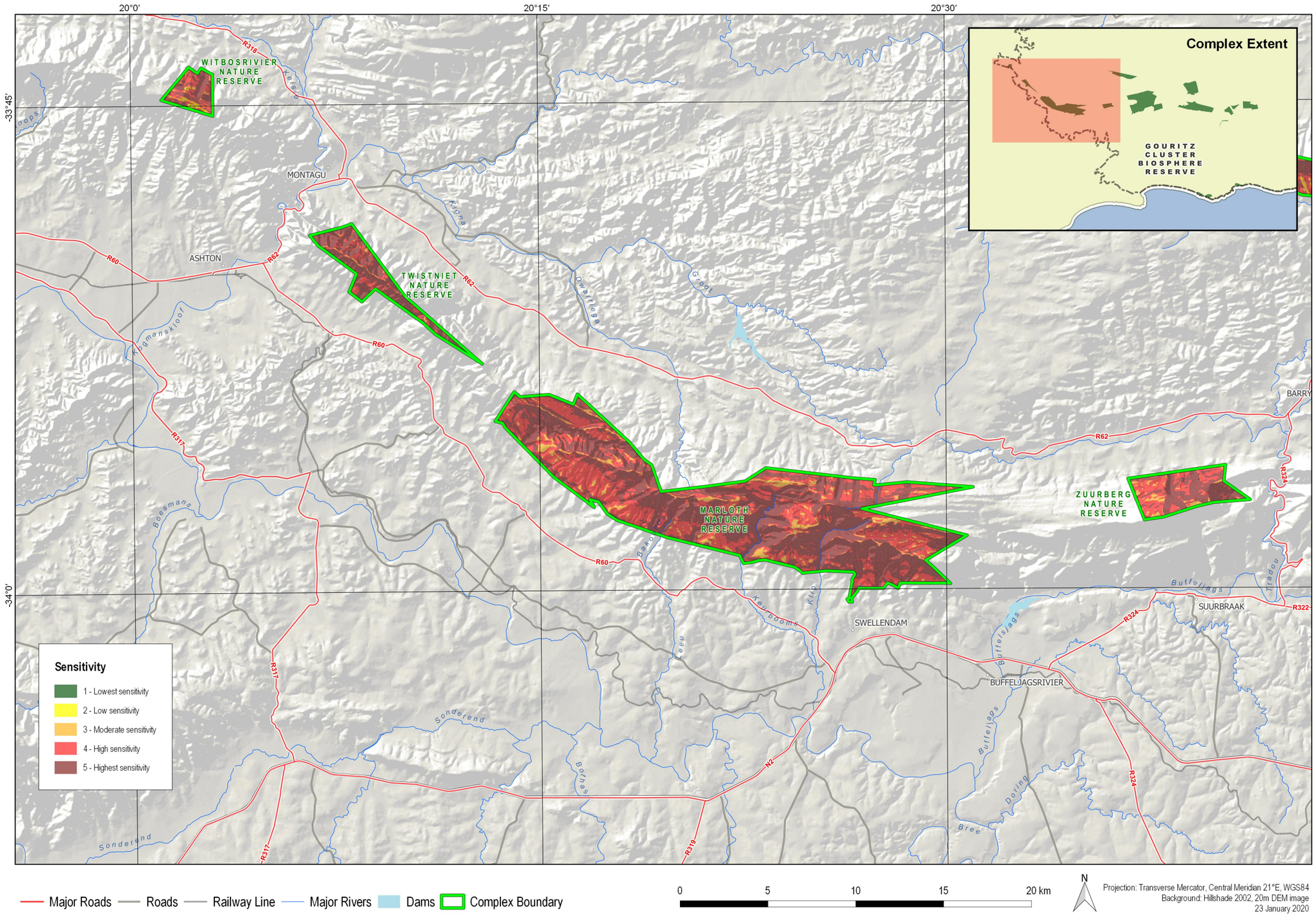
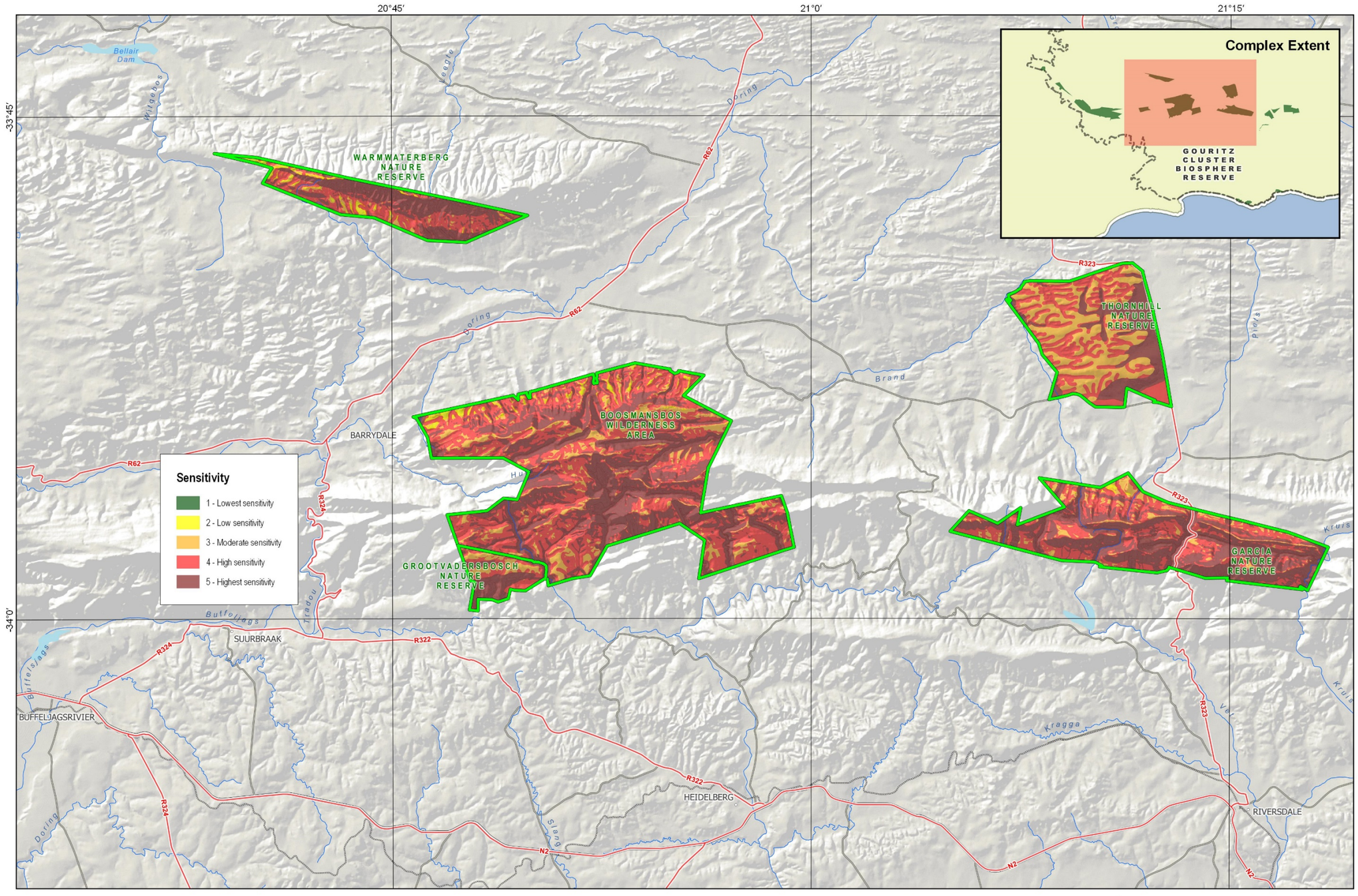


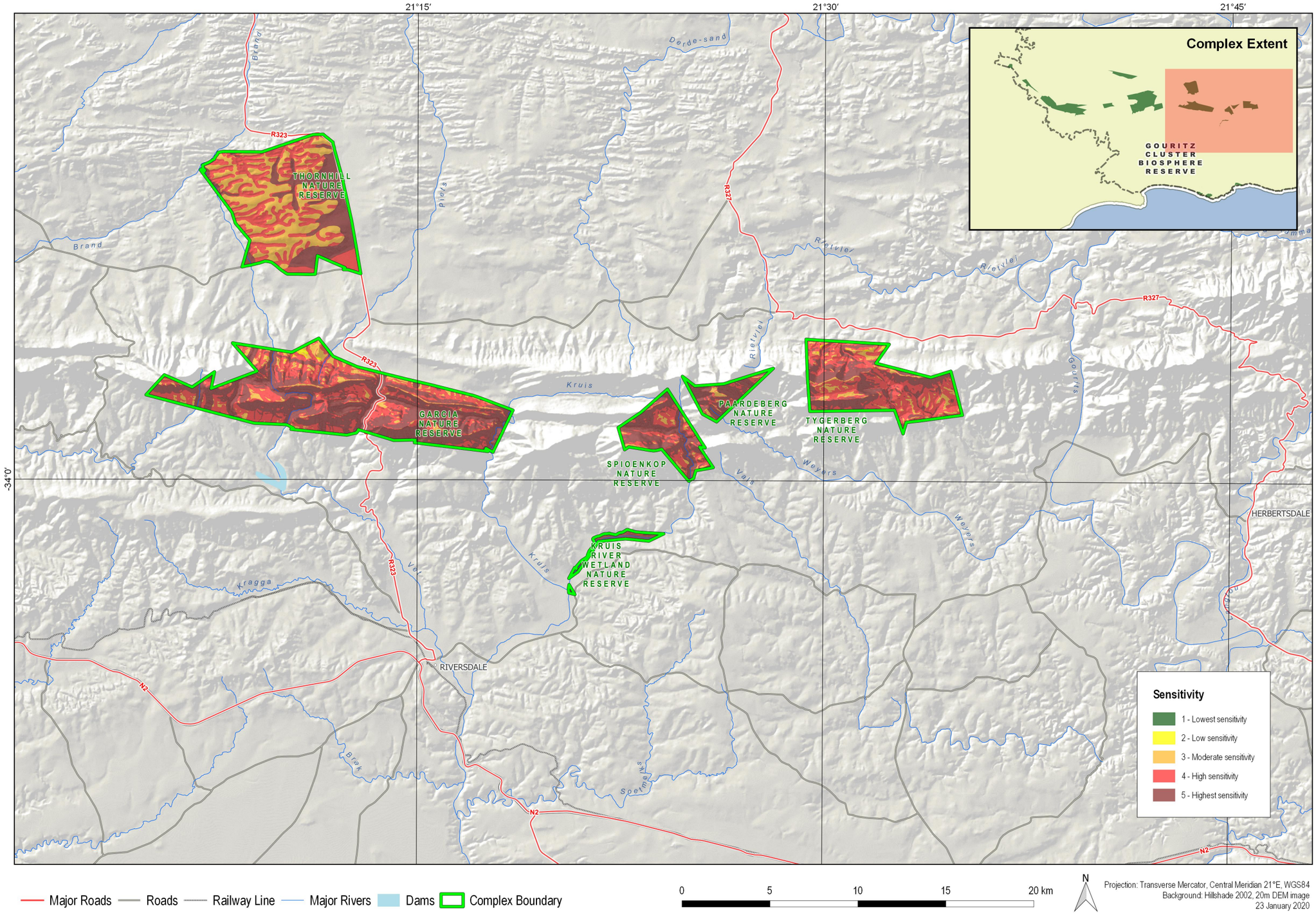
Map 8a: Sensitivity of the Marloth Nature Reserve Cluster in the Langeberg Complex.



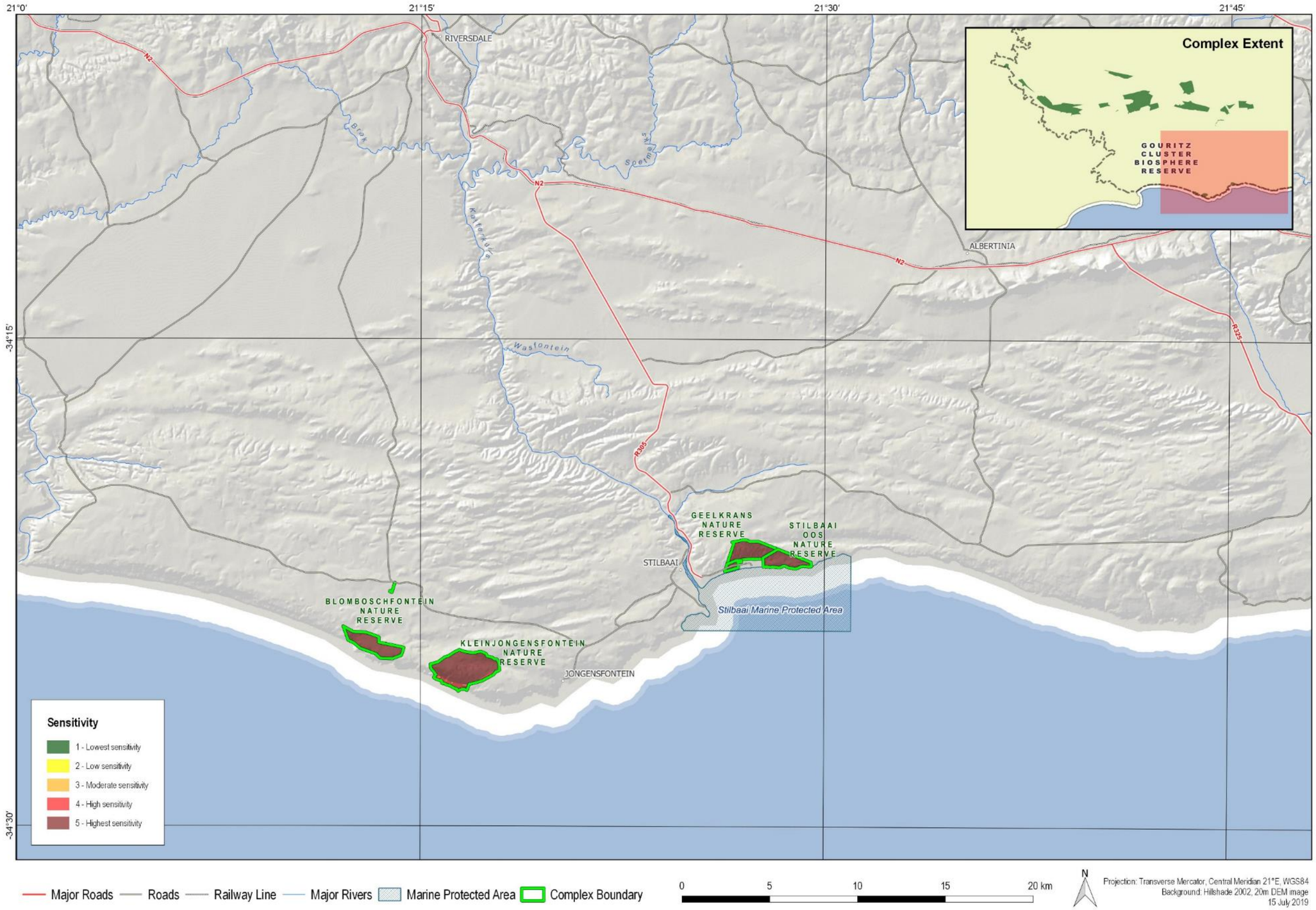
Map 8b: Sensitivity of the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



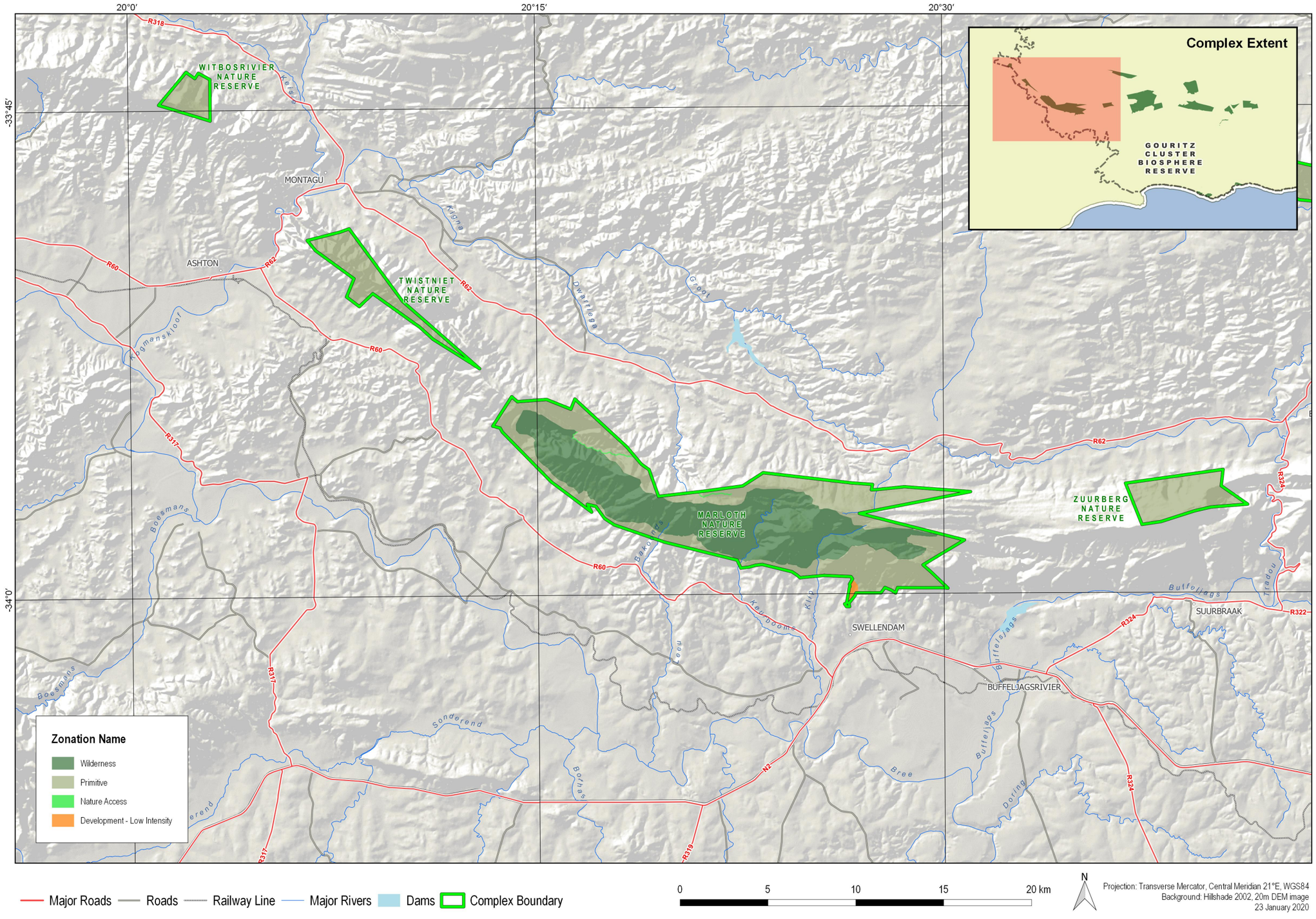
Map 8c: Sensitivity of the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



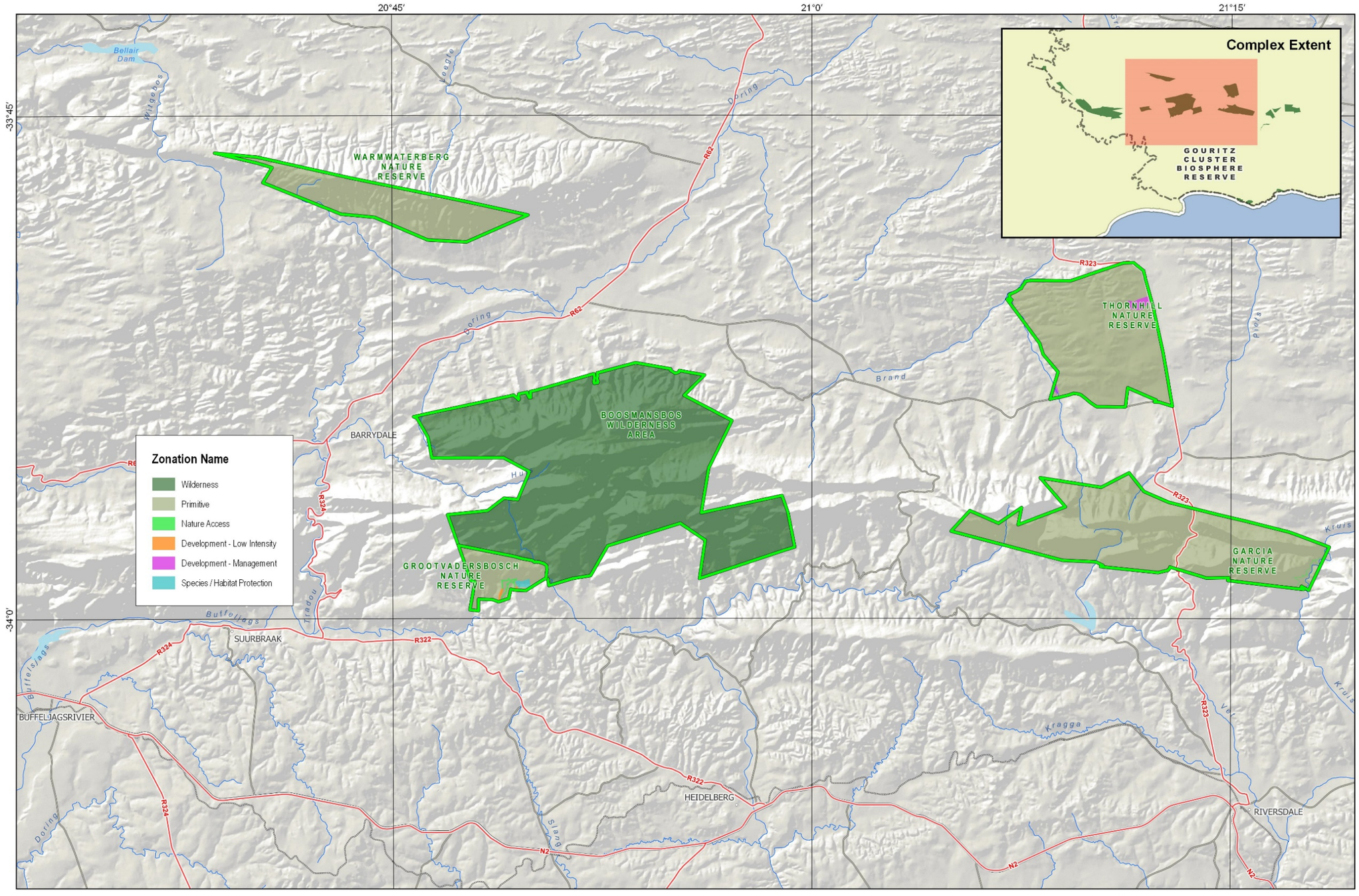
Map 8d: Sensitivity of the Geelkrans Nature Reserve Cluster in the Langeberg Complex.



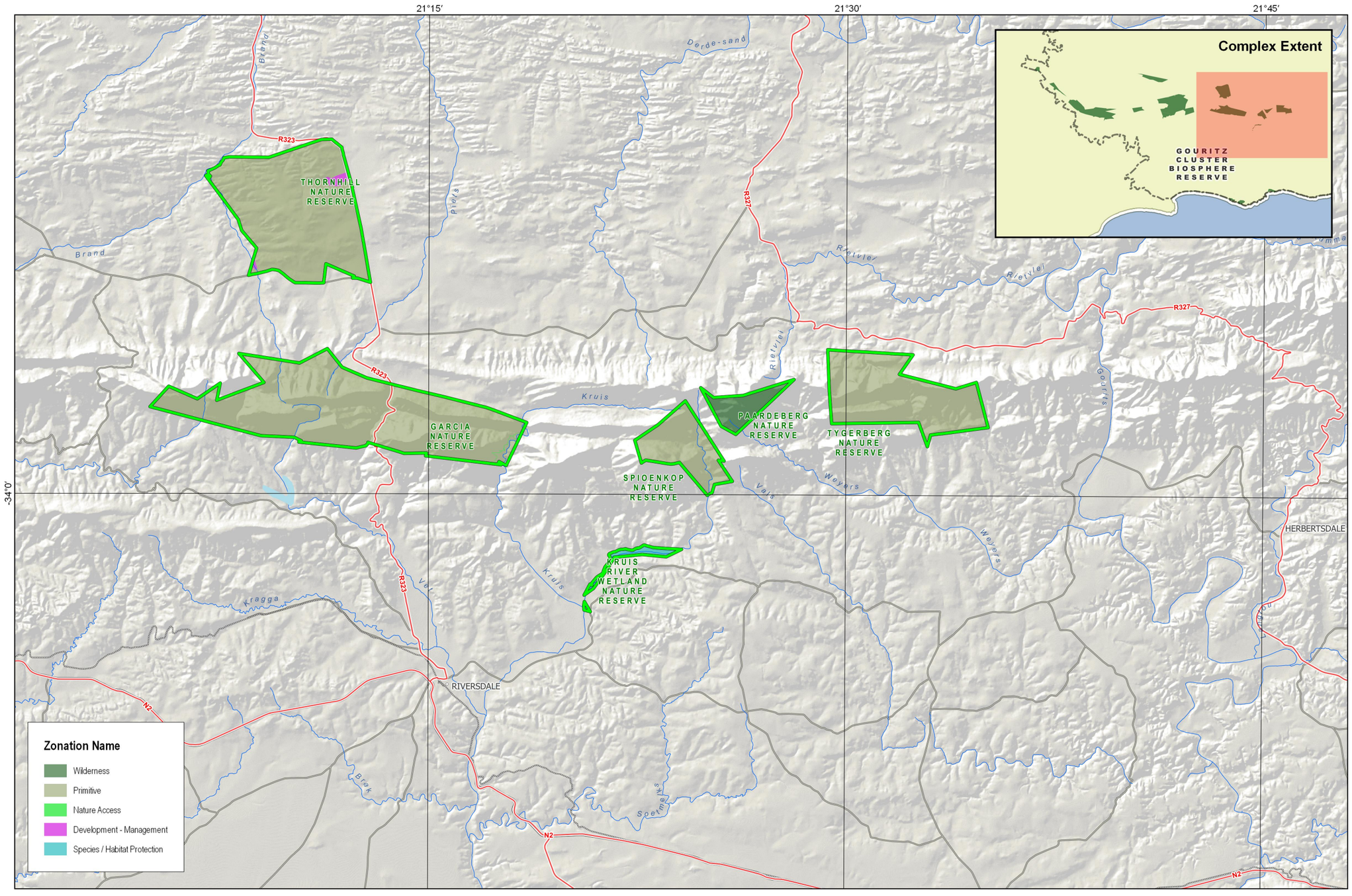
Map 9a: Zonation of the Marloth Nature Reserve Cluster in the Langeberg Complex.



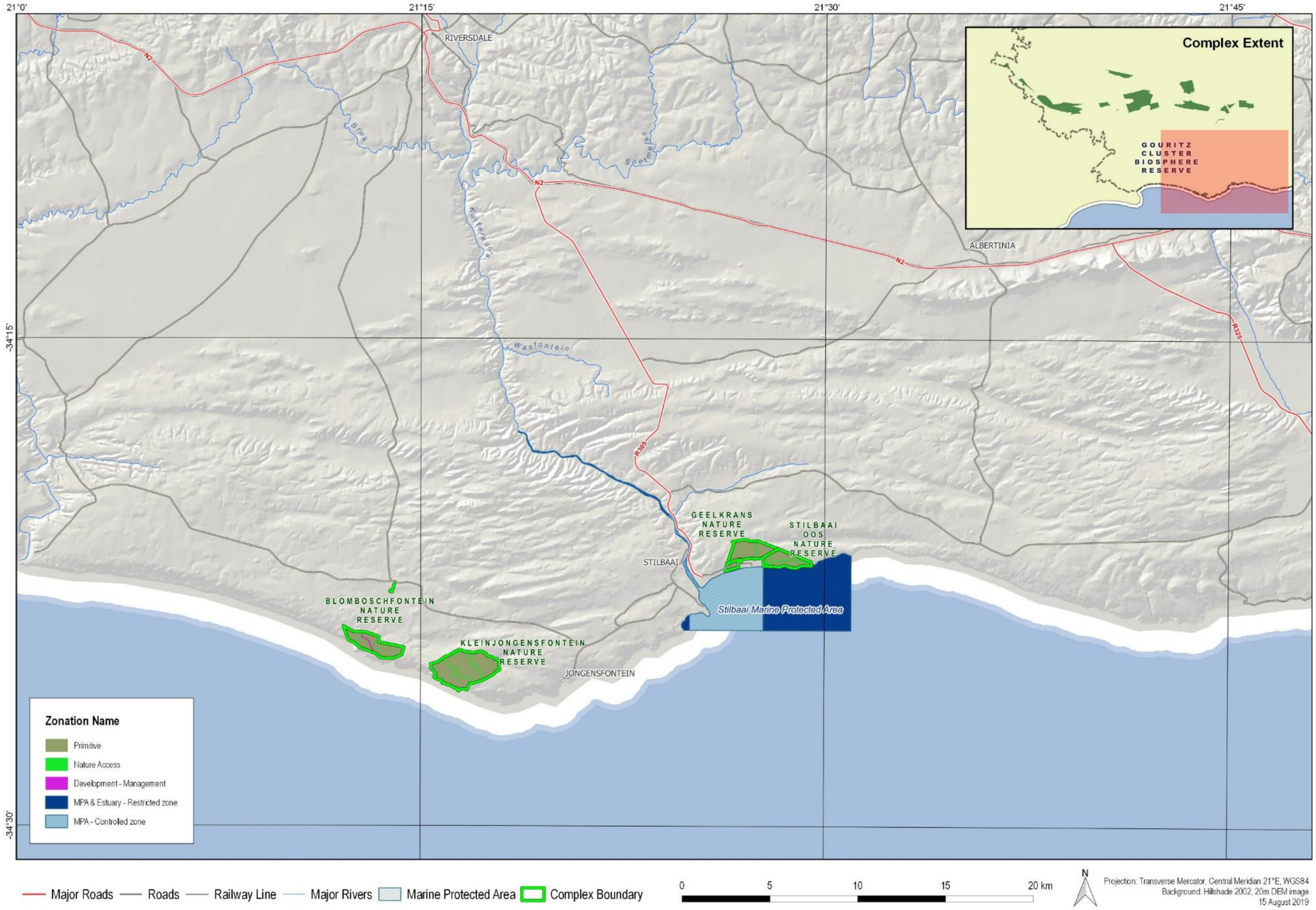
Map 9b: Zonation of the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



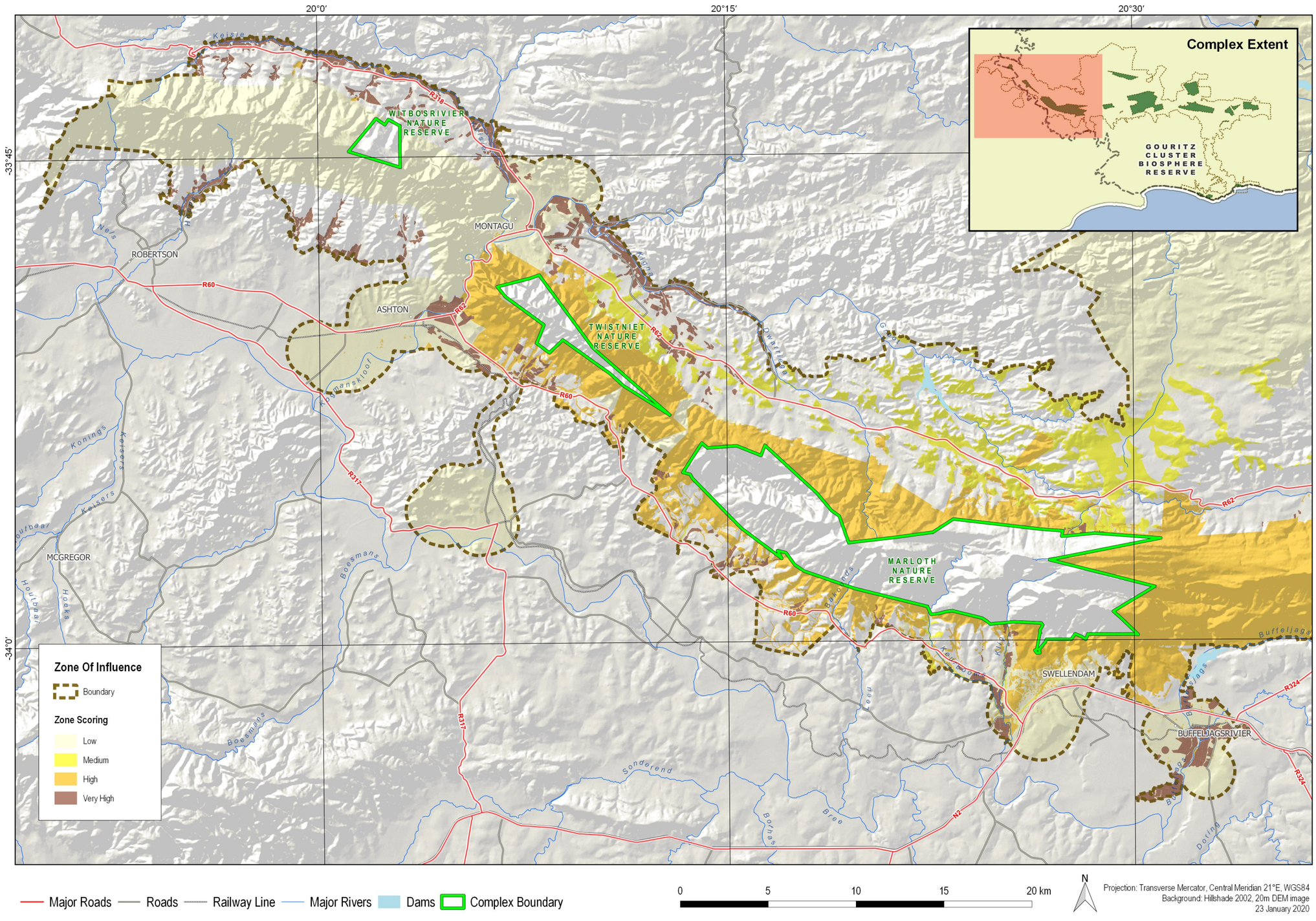
Map 9c: Zonation of the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



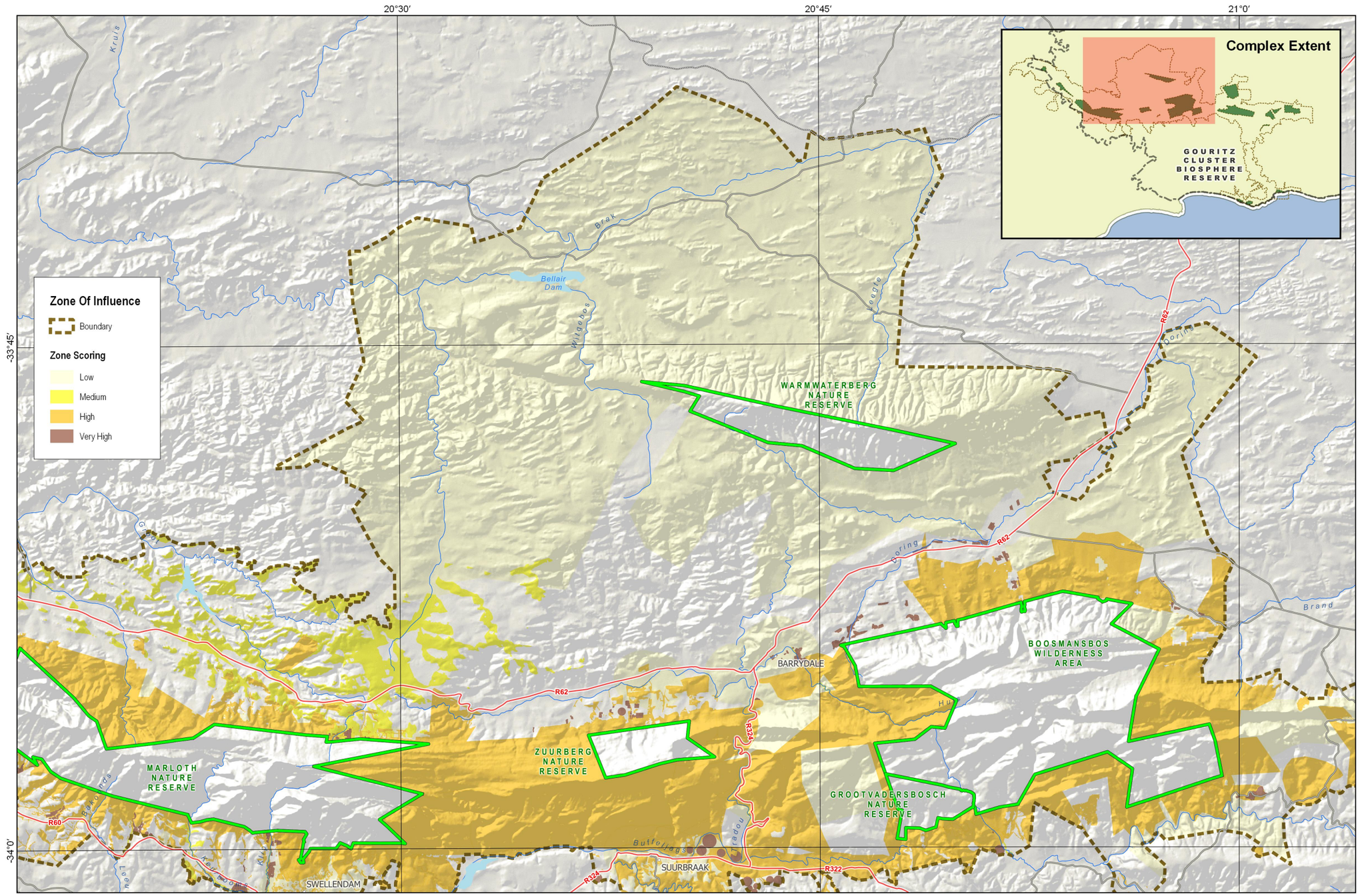
Map 9d: Zonation of the Geelkrans Nature Reserve Cluster in the Langeberg Complex.



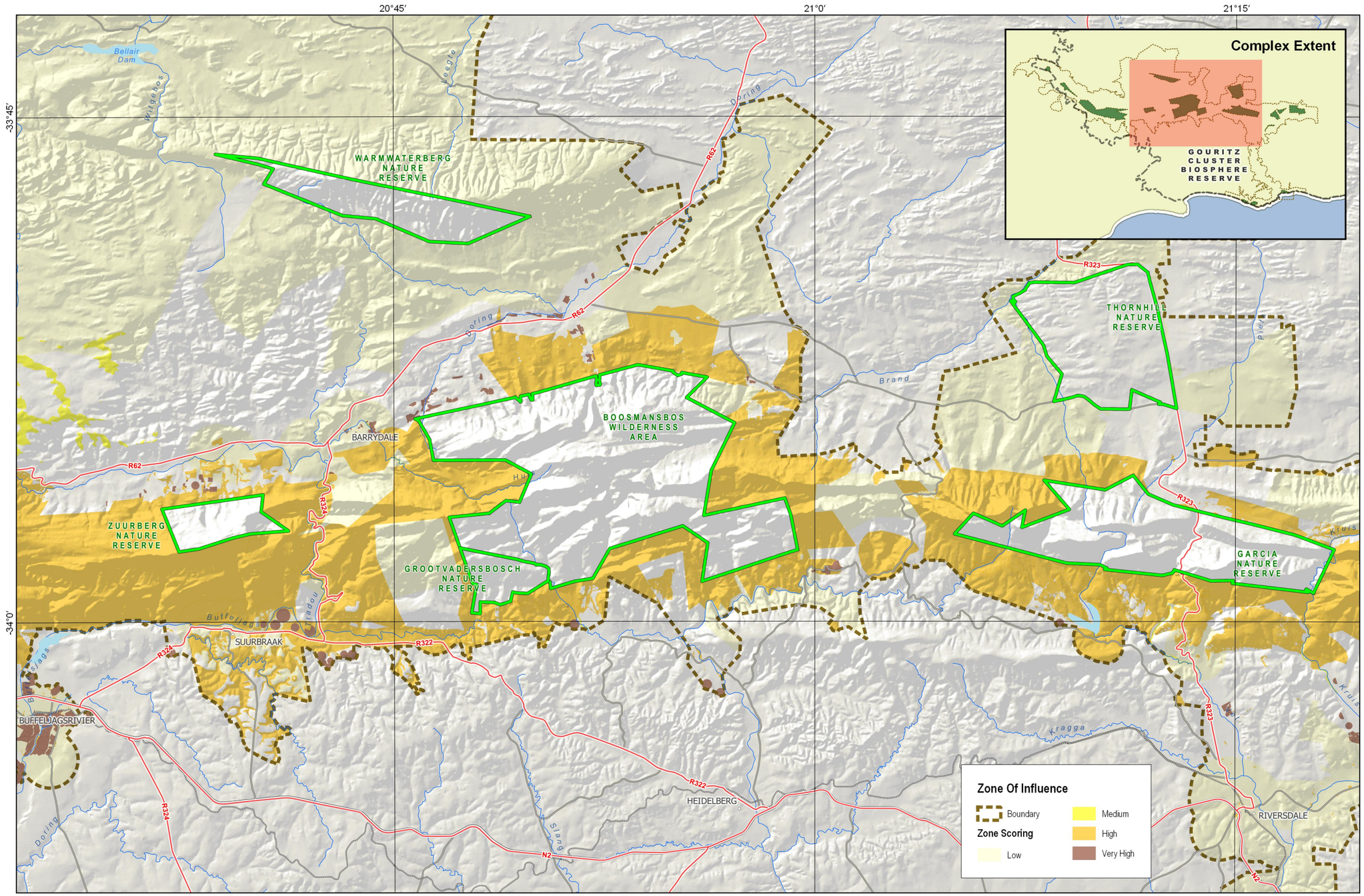
Map 10a: Zone of influence around the Marloth Nature Reserve Cluster in the Langeberg Complex (Zuurberg Nature Reserve on Map 10b).



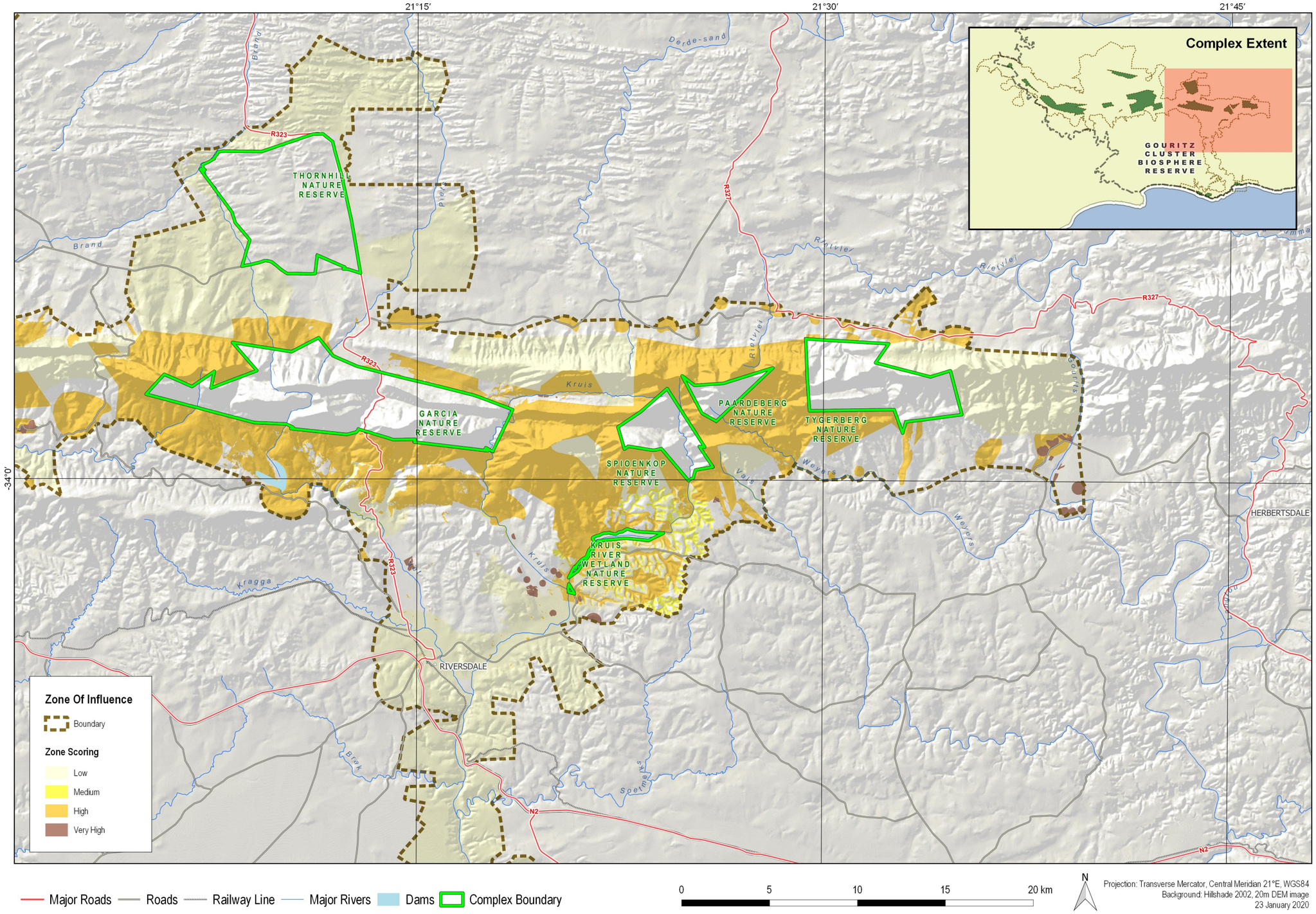
Map 10b: Zone of influence around Warmwaterberg Nature Reserve in the Langeberg Complex.



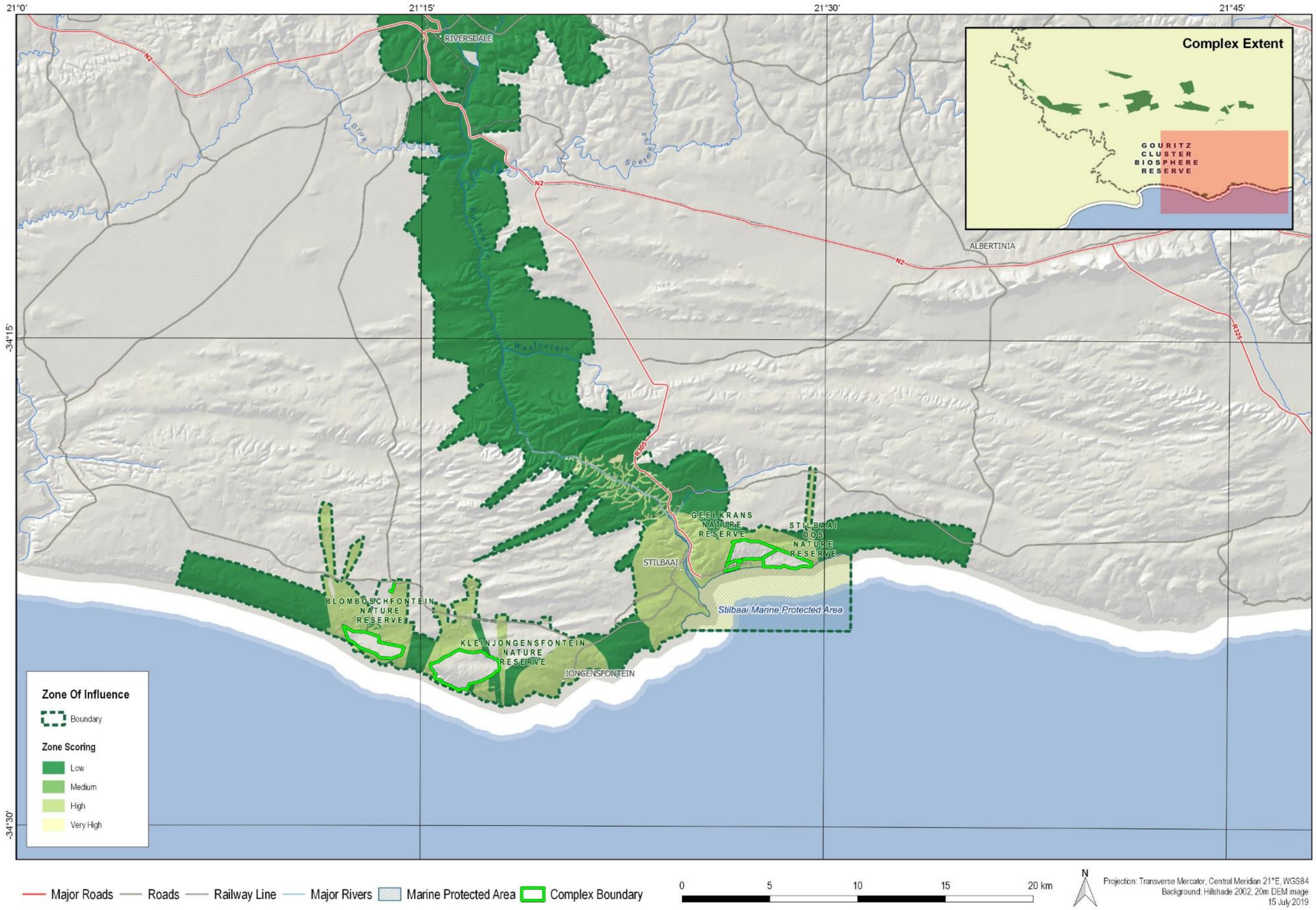
Map 10c: Zone of influence around the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex (Zuurberg Nature Reserve part of Marloth Nature Reserve Cluster).



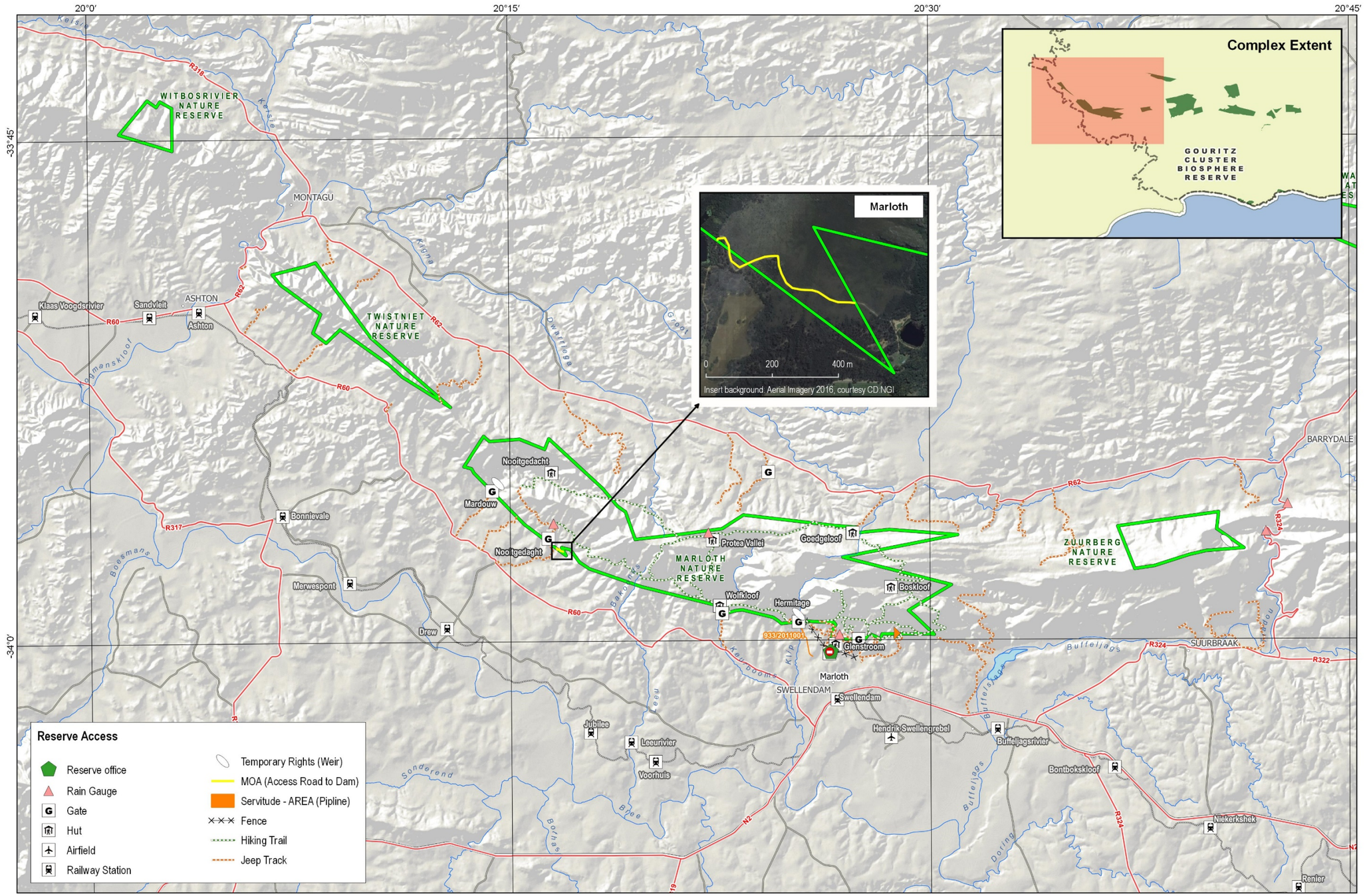
Map 10d: Zone of influence around the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



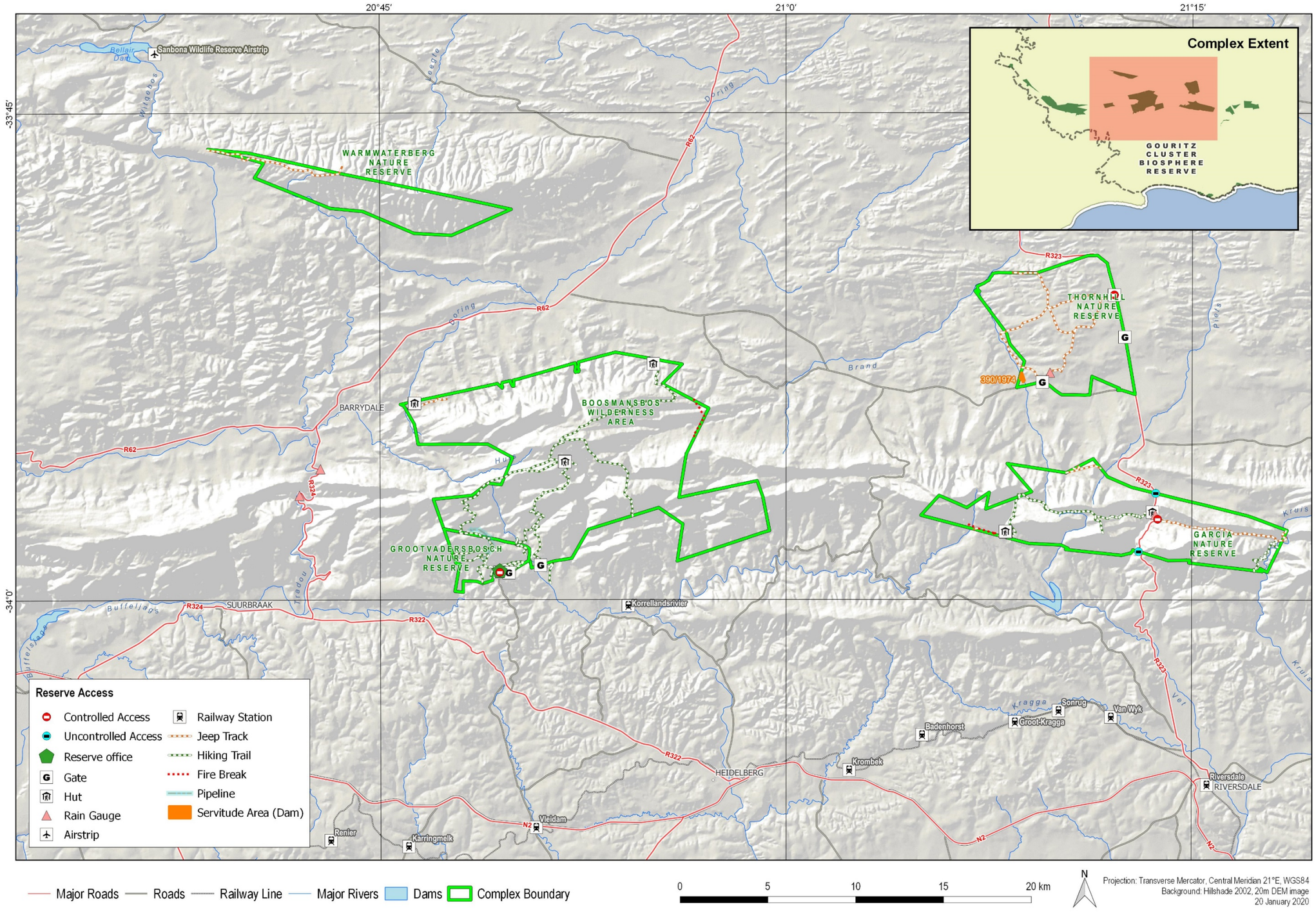
Map 10e: Zone of influence around the Geelkrans Nature Reserve Cluster in the Langeberg Complex.



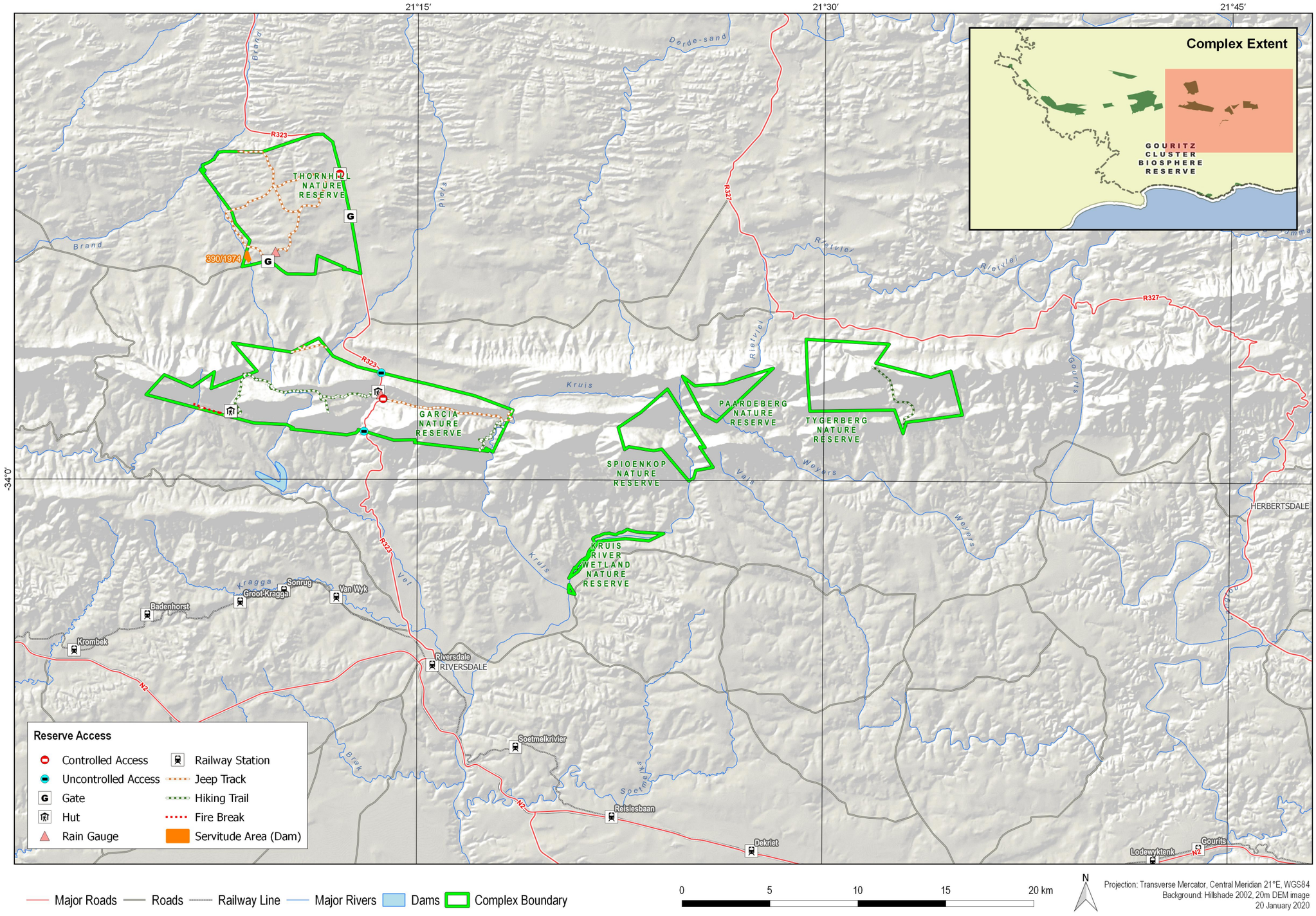
Map 11a: Access and servitudes on the Marloth Nature Reserve Cluster in the Langeberg Complex.



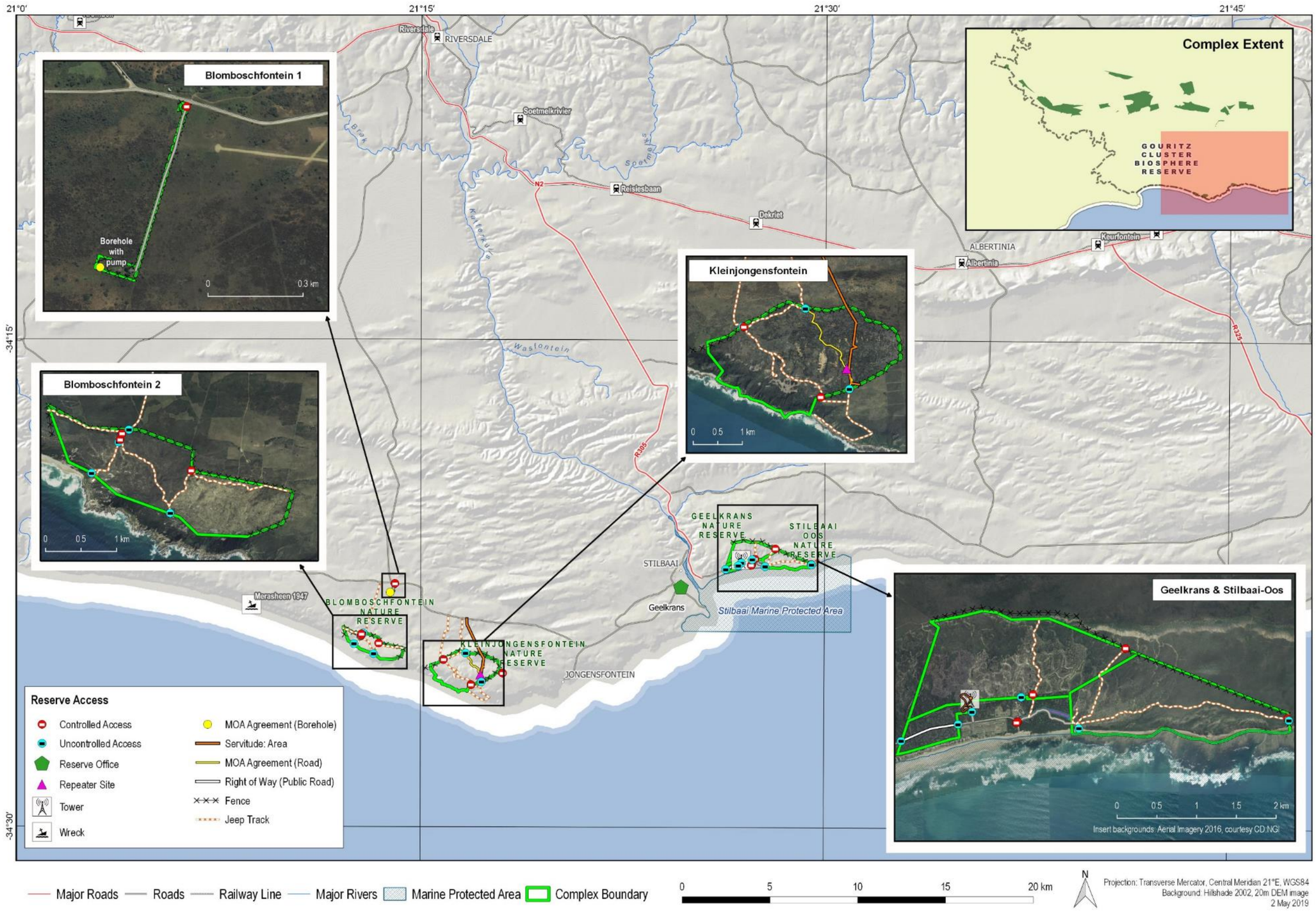
Map 11b: Access and servitudes on the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



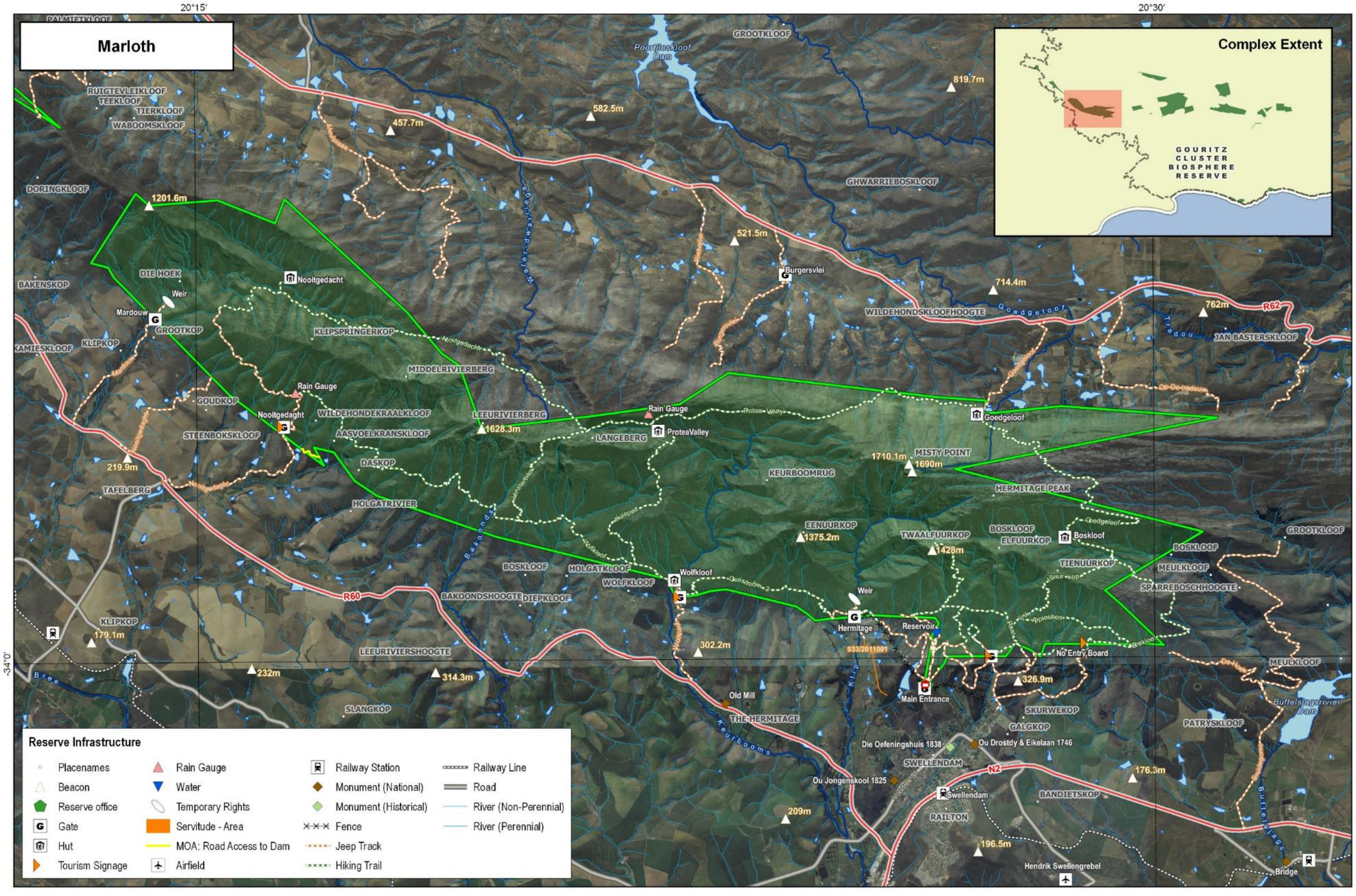
Map 11c: Access and servitudes on the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex.



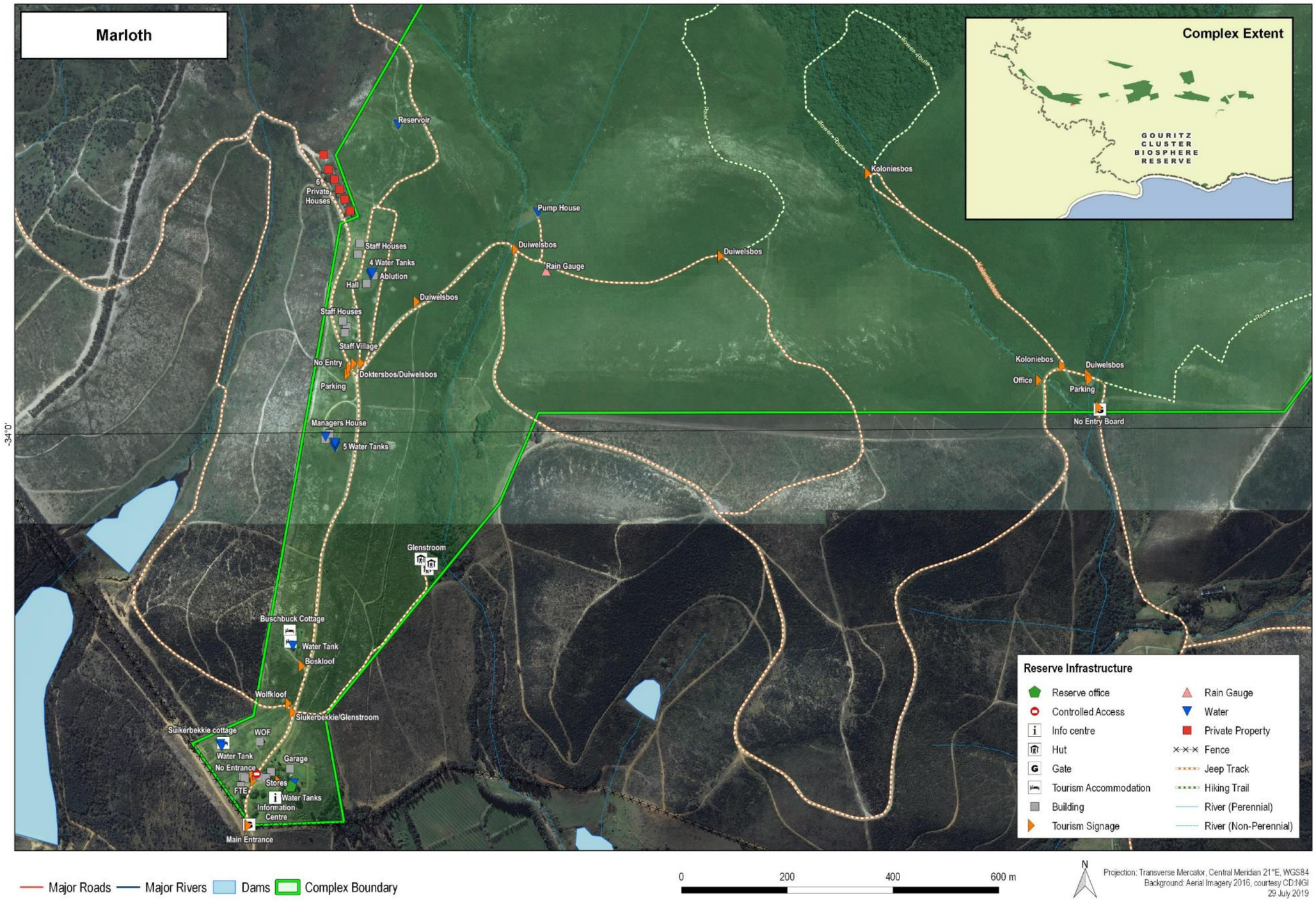
Map 11d: Access and servitudes on the Geelkrans Nature Reserve Cluster in the Langeberg Complex.



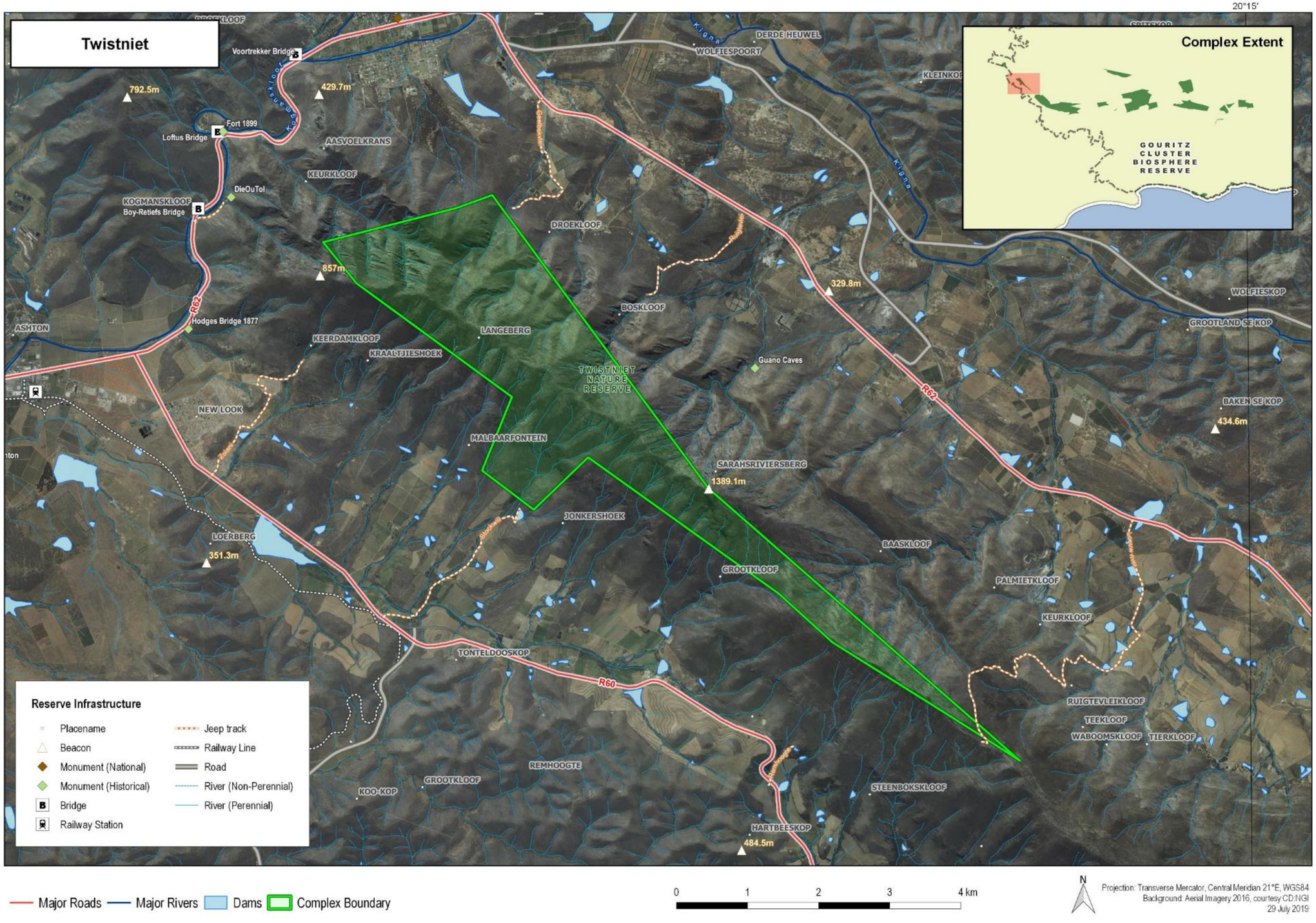
Map 12a: Infrastructure and servitudes on the Marloth Nature Reserve Cluster.



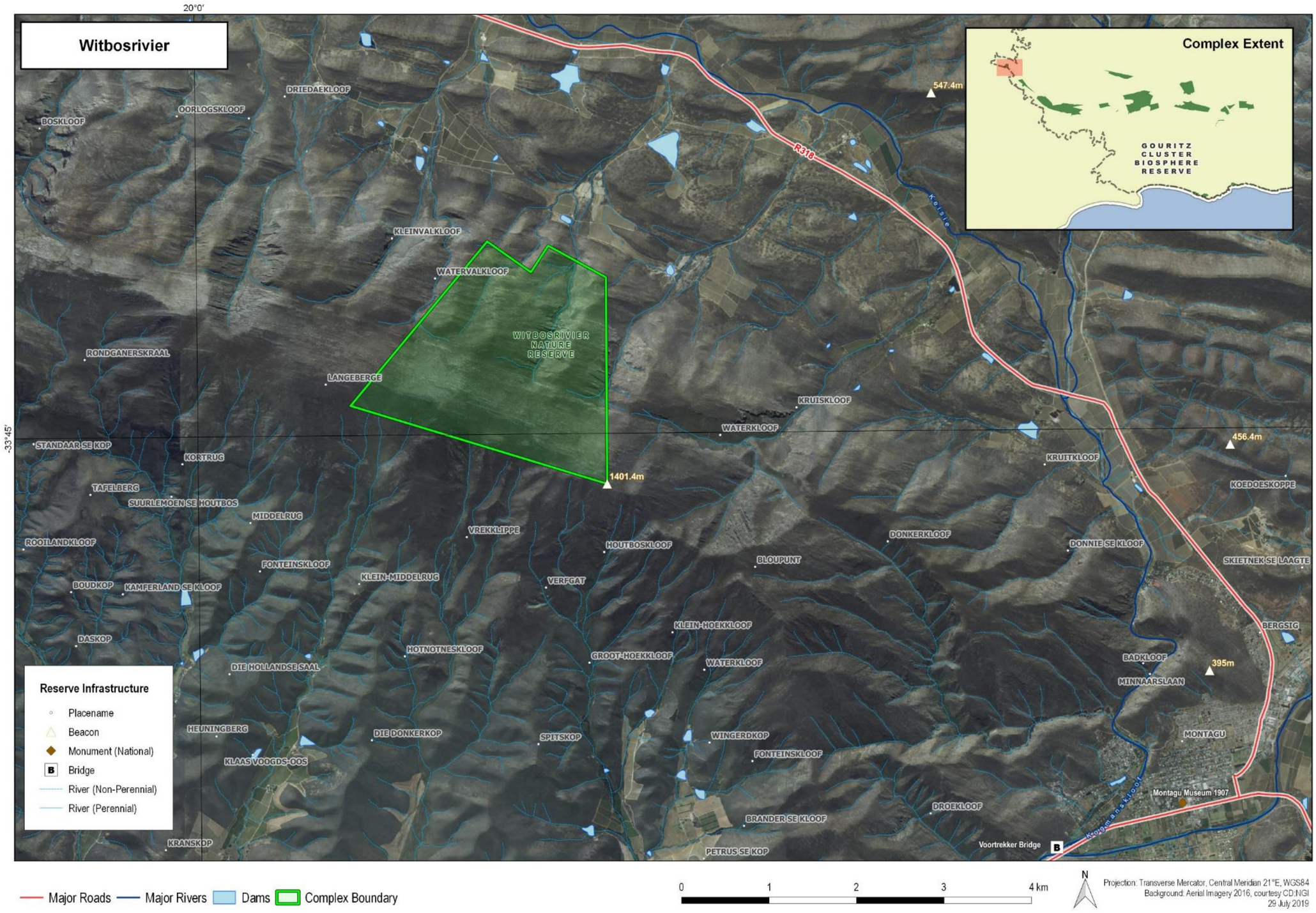
Map 12b: Infrastructure and servitudes on the Marloth Nature Reserve administrative centre.



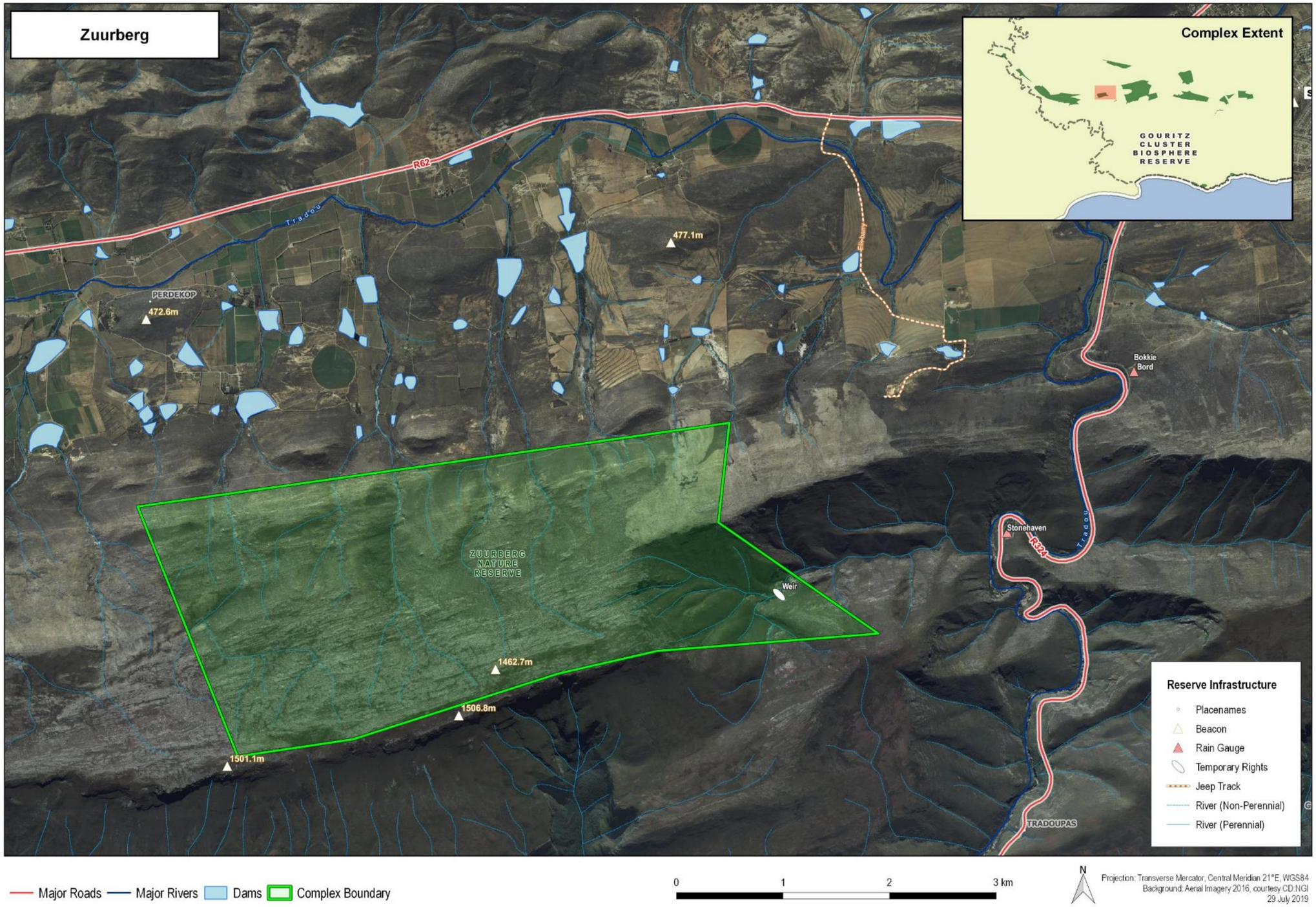
Map 12c: Infrastructure and servitudes on Twistniet Nature Reserve.



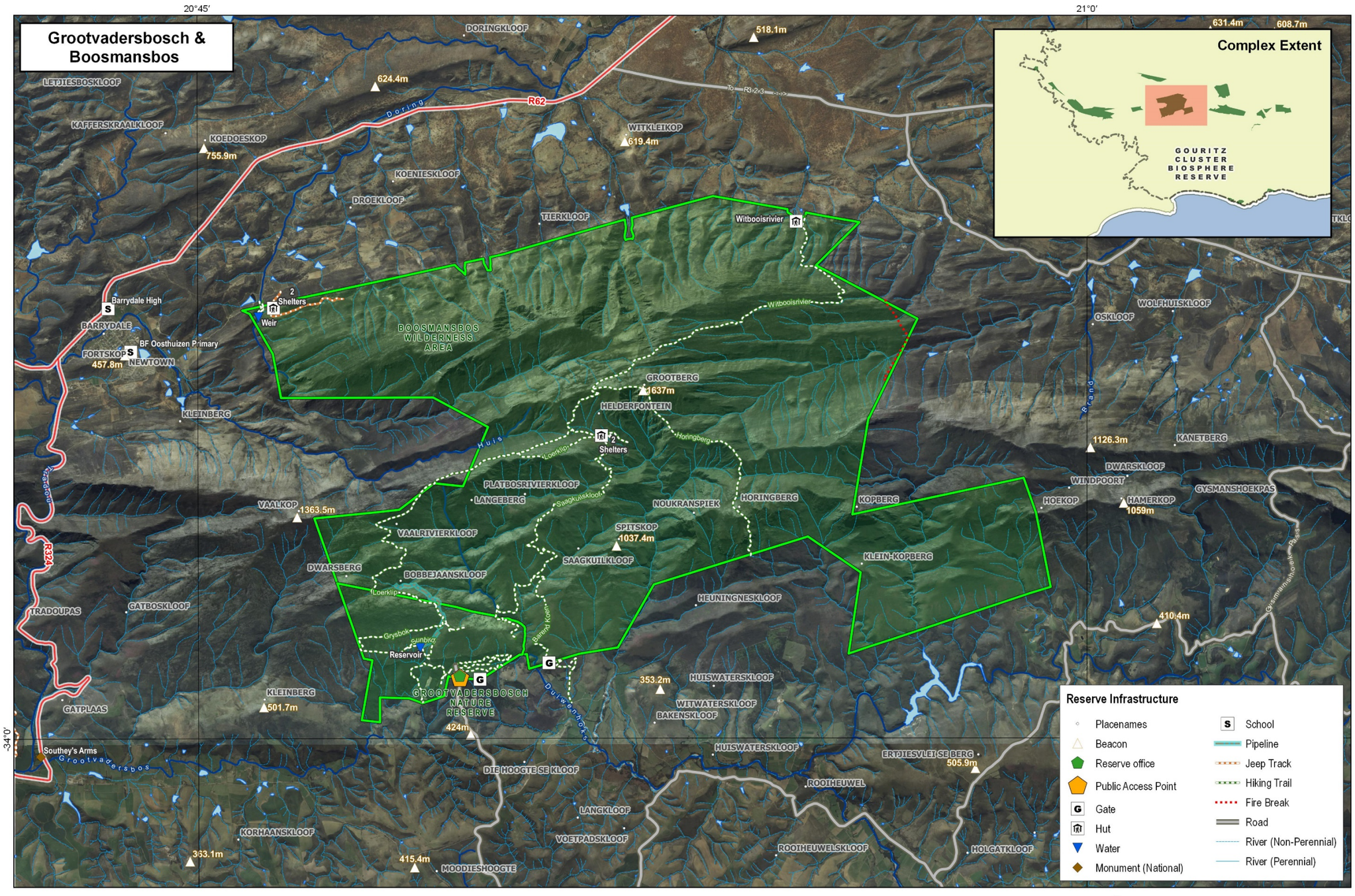
Map 12d: Infrastructure and servitudes on Witbosrivier Nature Reserve.



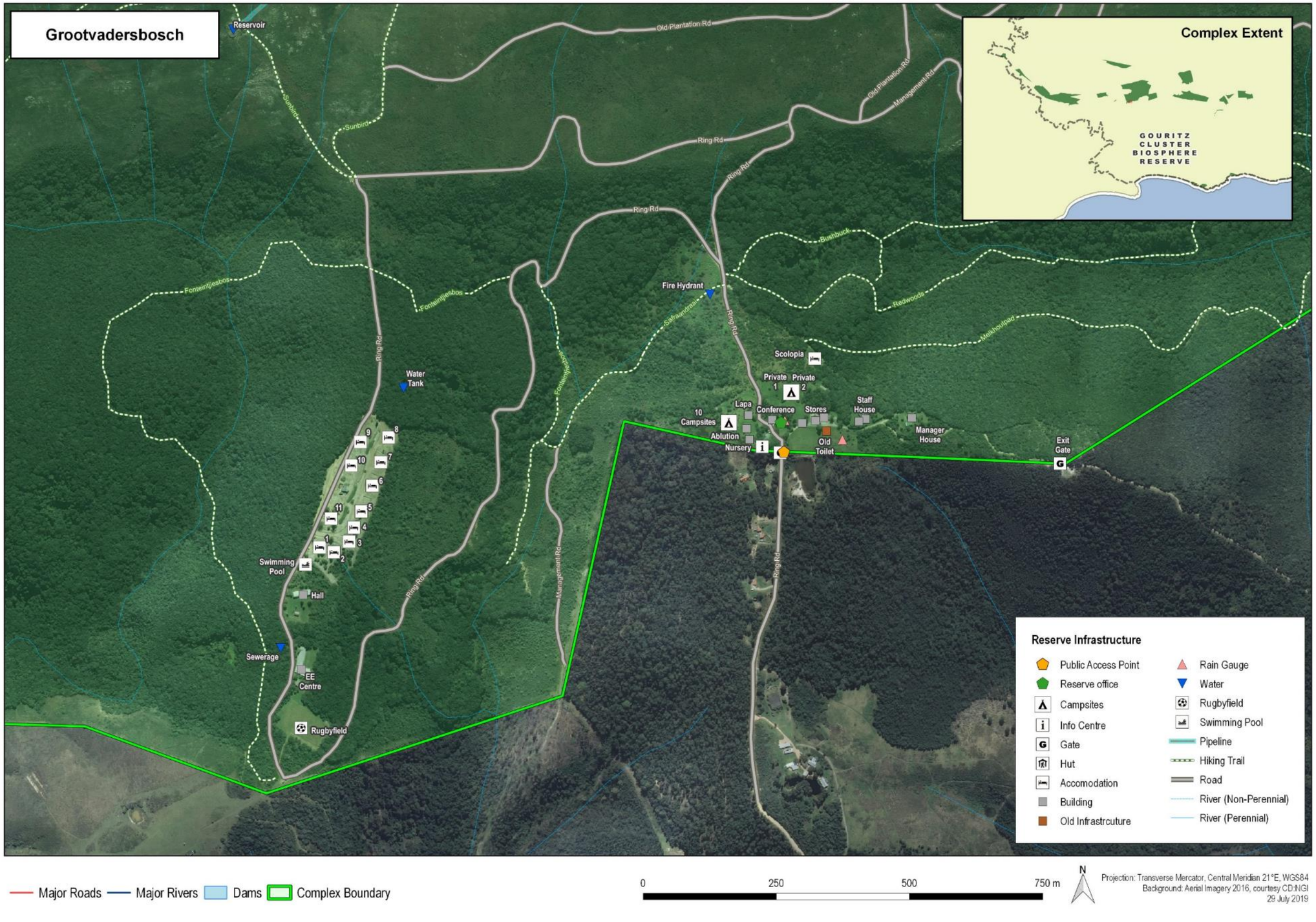
Map 12e: Infrastructure and servitudes on Zuurberg Nature Reserve.



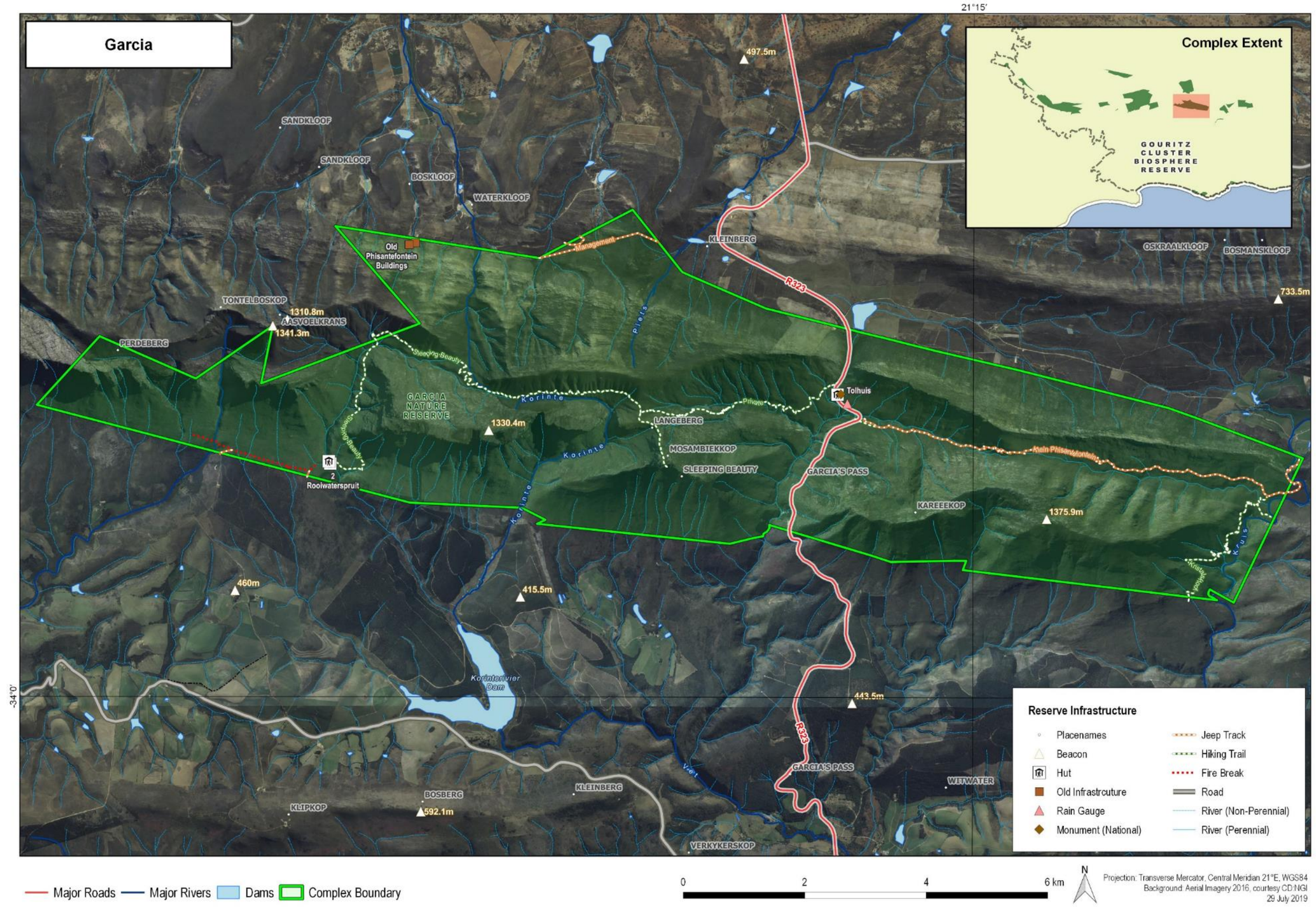
Map 12f: Infrastructure and servitudes on Grootvadersbosch Nature Reserve and Boosmansbos Wilderness Area.



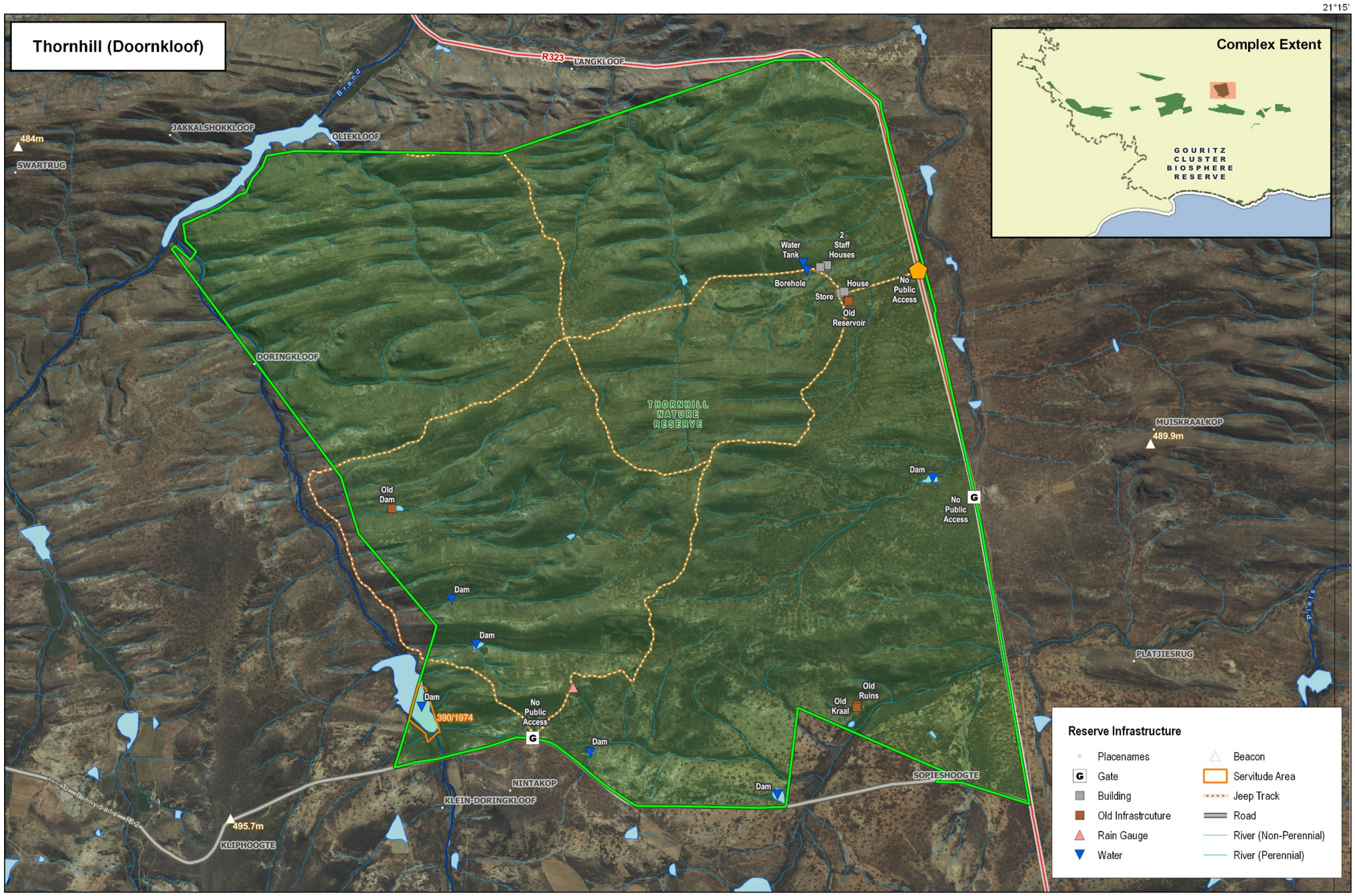
Map 12g: Infrastructure and servitudes on Grootvadersbosch Nature Reserve administrative centre.



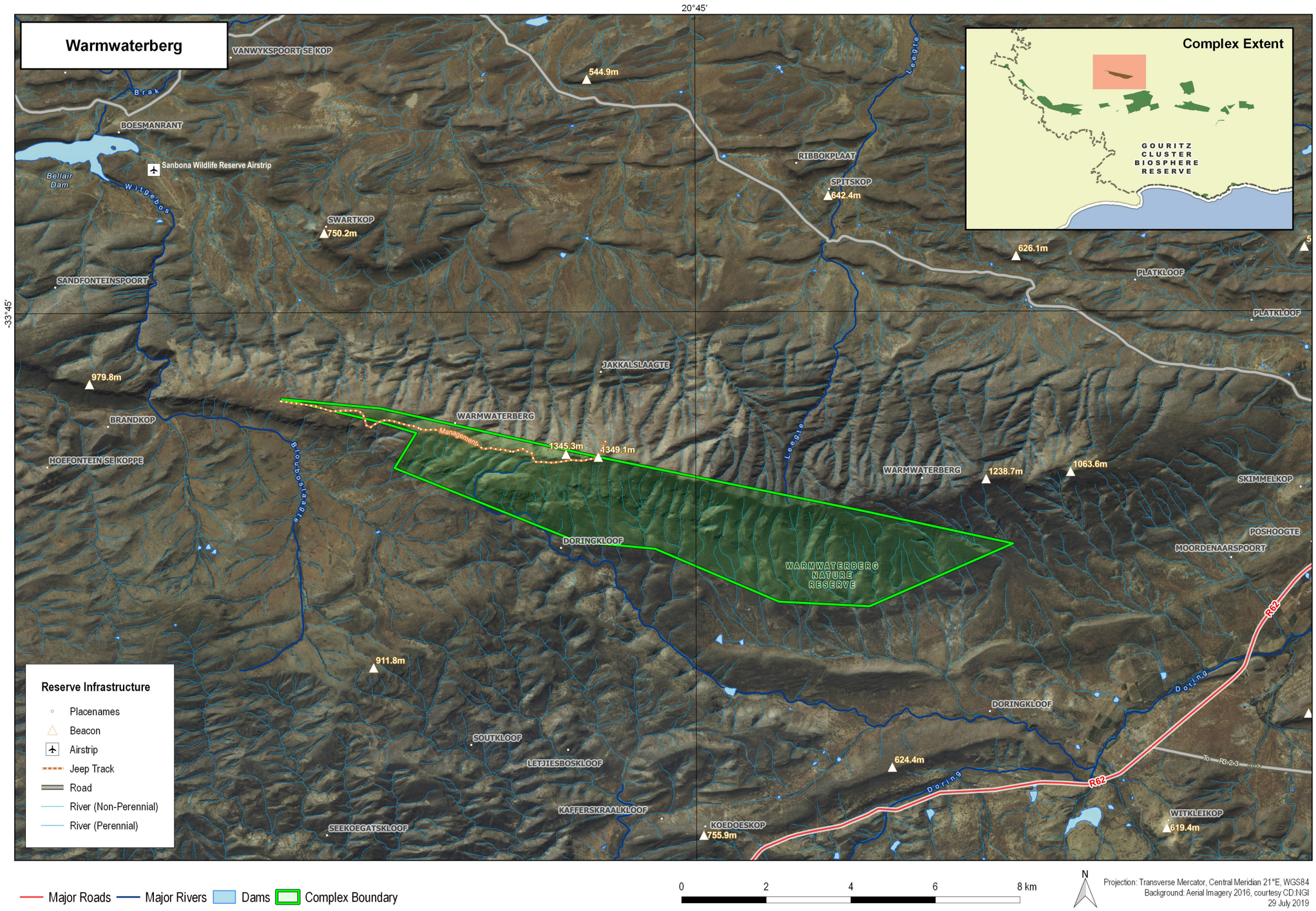
Map 12h: Infrastructure and servitudes on Garcia Nature Reserve.



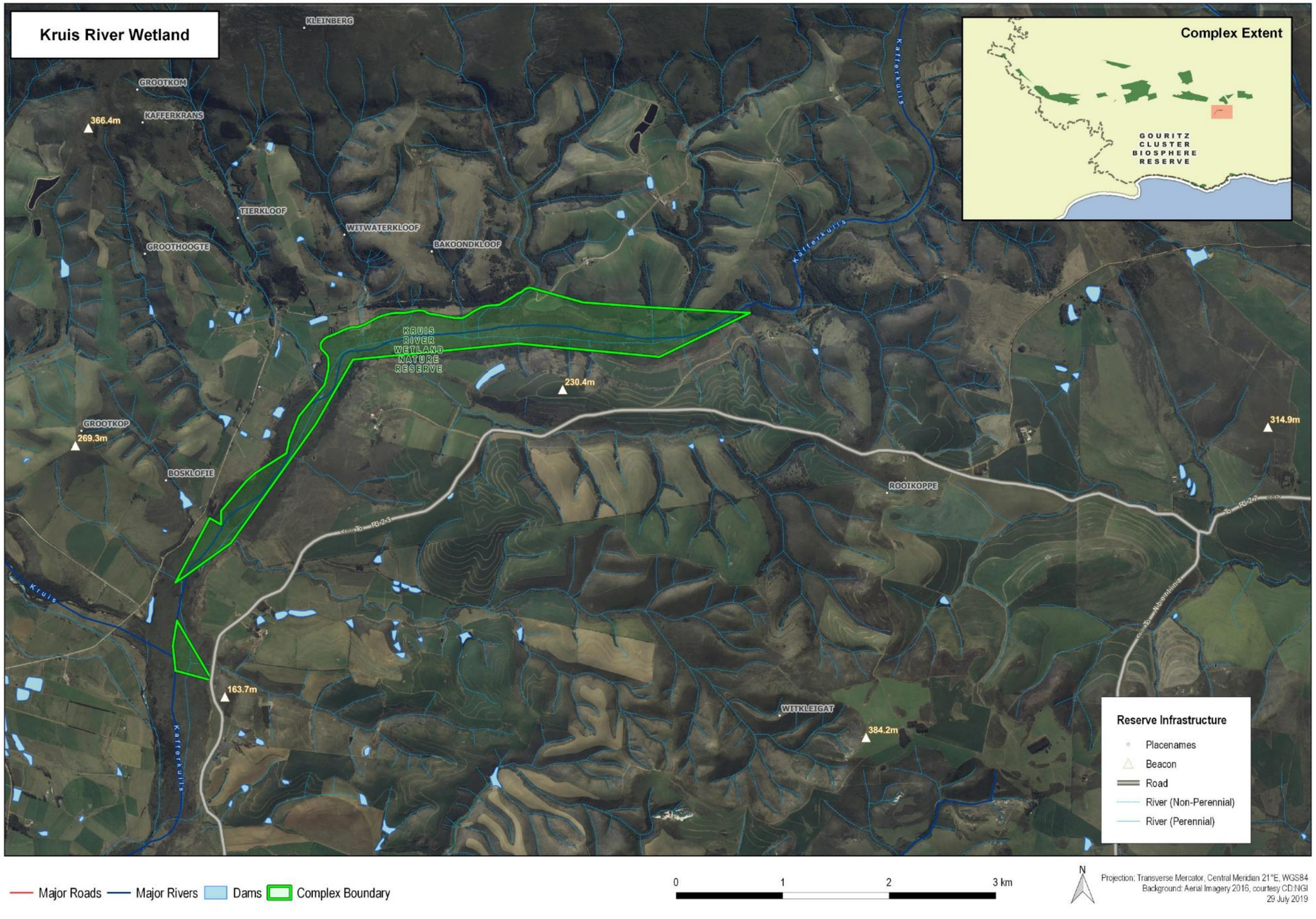
Map 12i: Infrastructure and servitudes on Thornhill (Doornkloof) Nature Reserve.



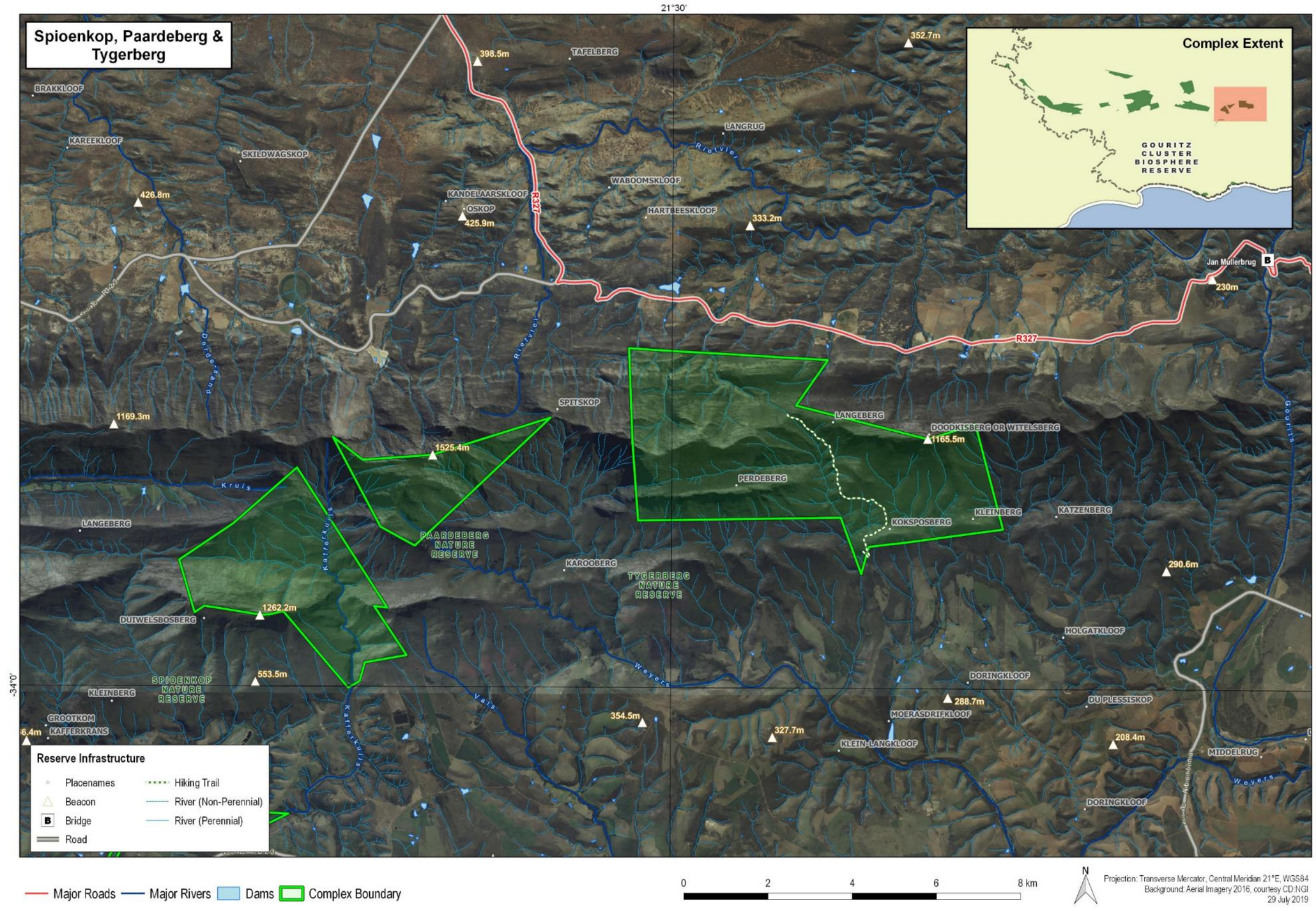
Map 12j: Infrastructure and servitudes on Warmwaterberg Nature Reserve.



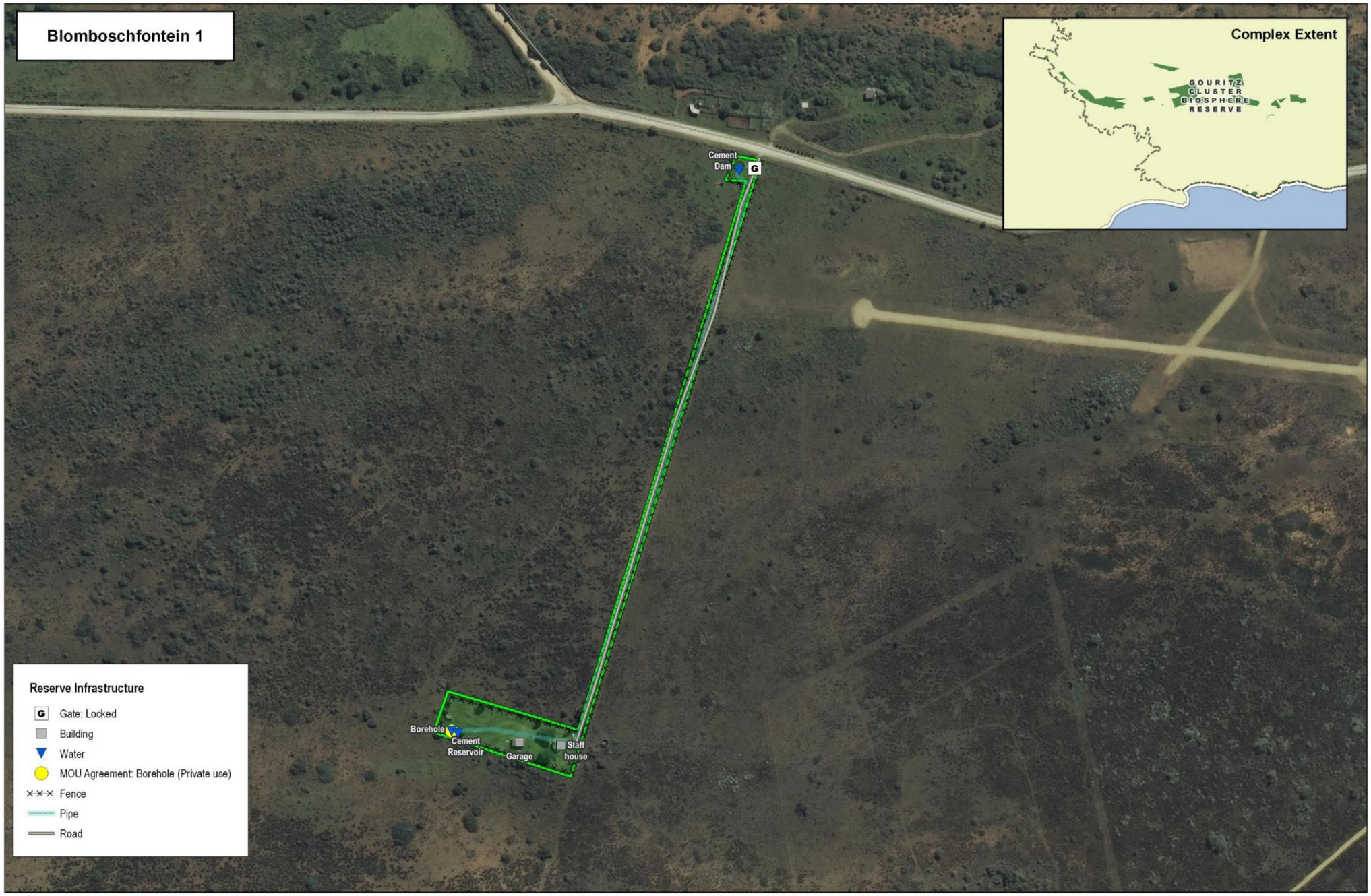
Map 12k: Infrastructure and servitudes on Kruis River Wetland Nature Reserve.



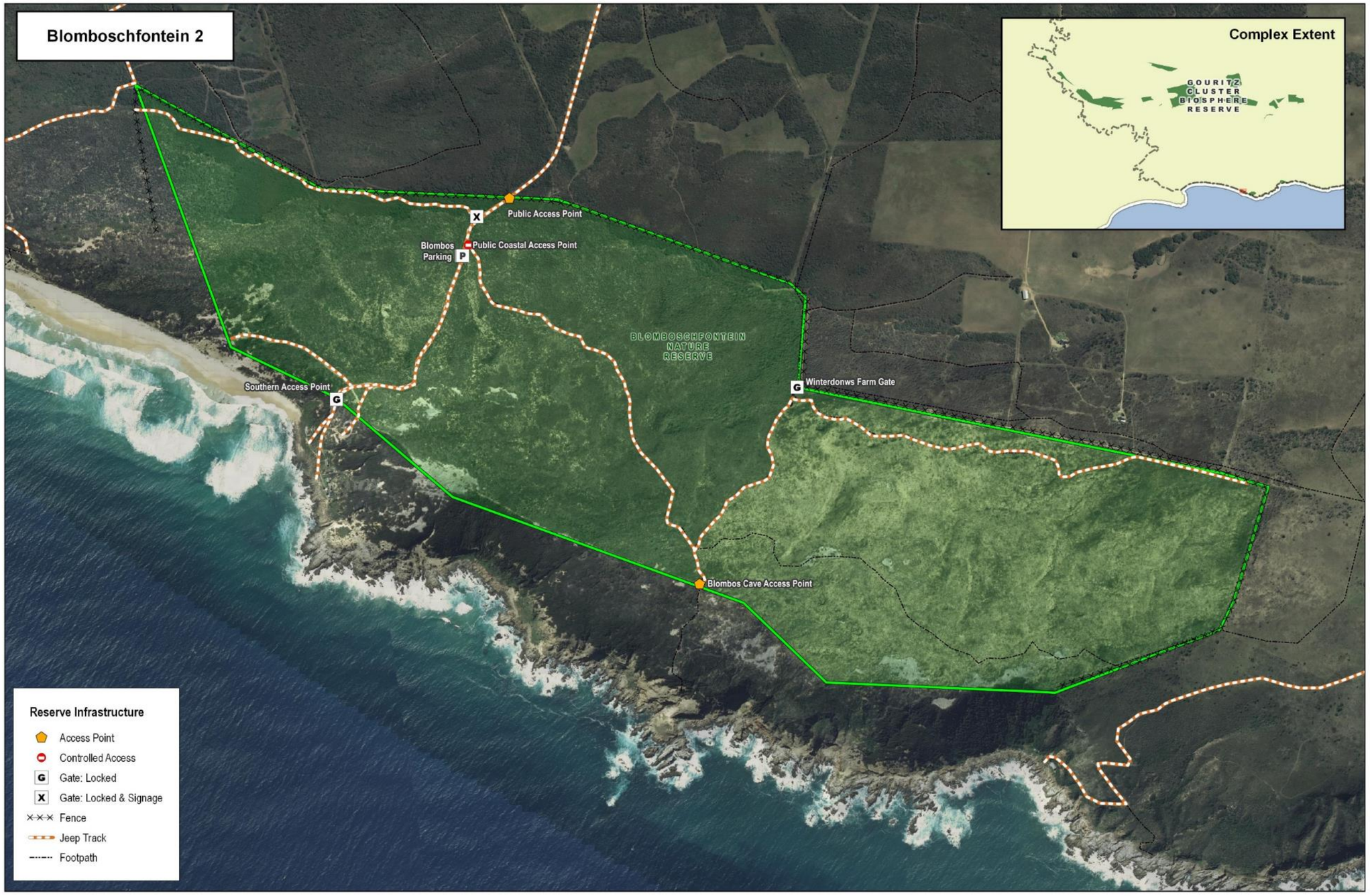
Map 12I: Infrastructure and servitudes on Spioenkop, Paardeberg and Tygerberg Nature Reserves.



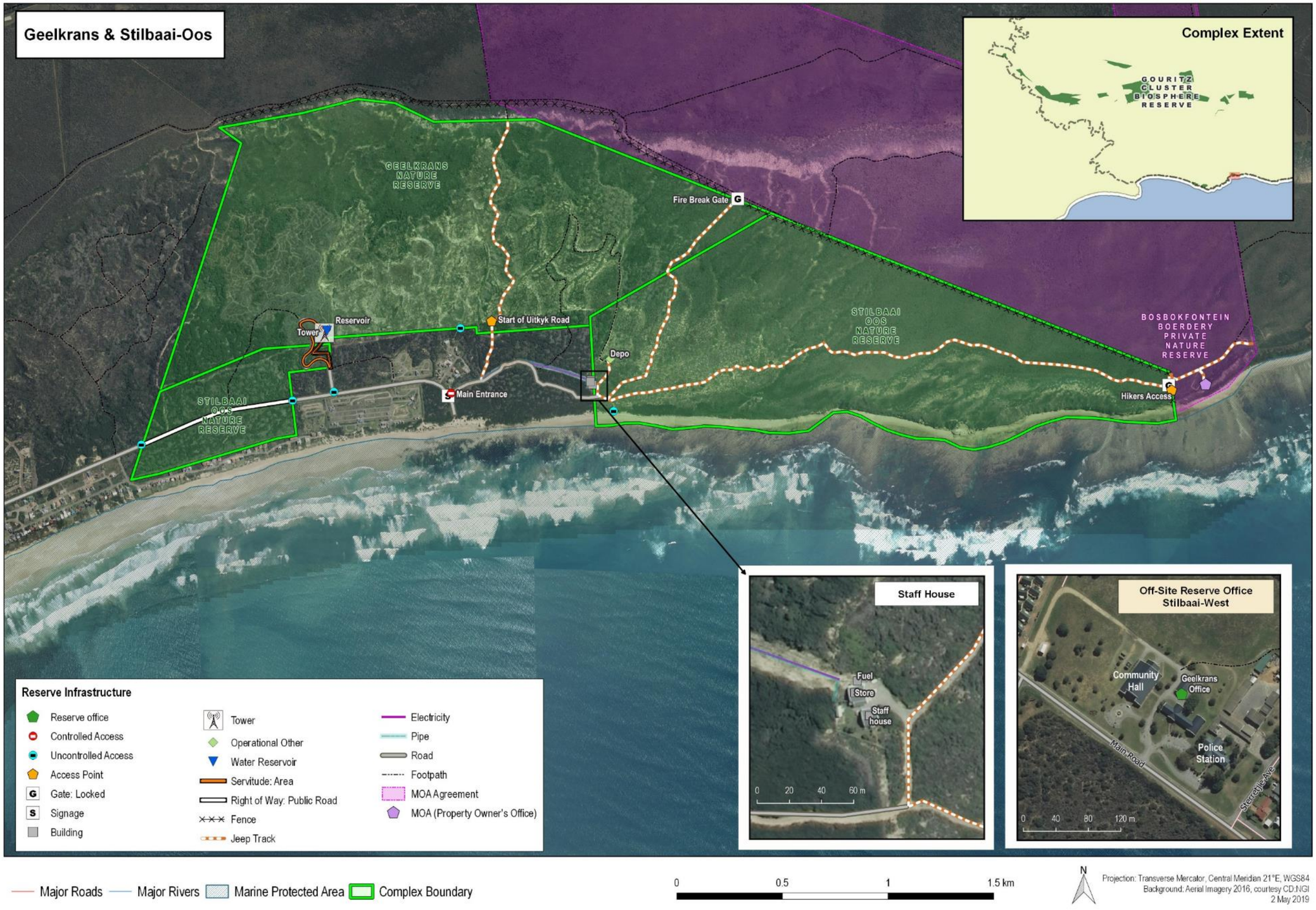
Map 12m: Infrastructure and servitudes on Blomboschfontein 1 Nature Reserves.



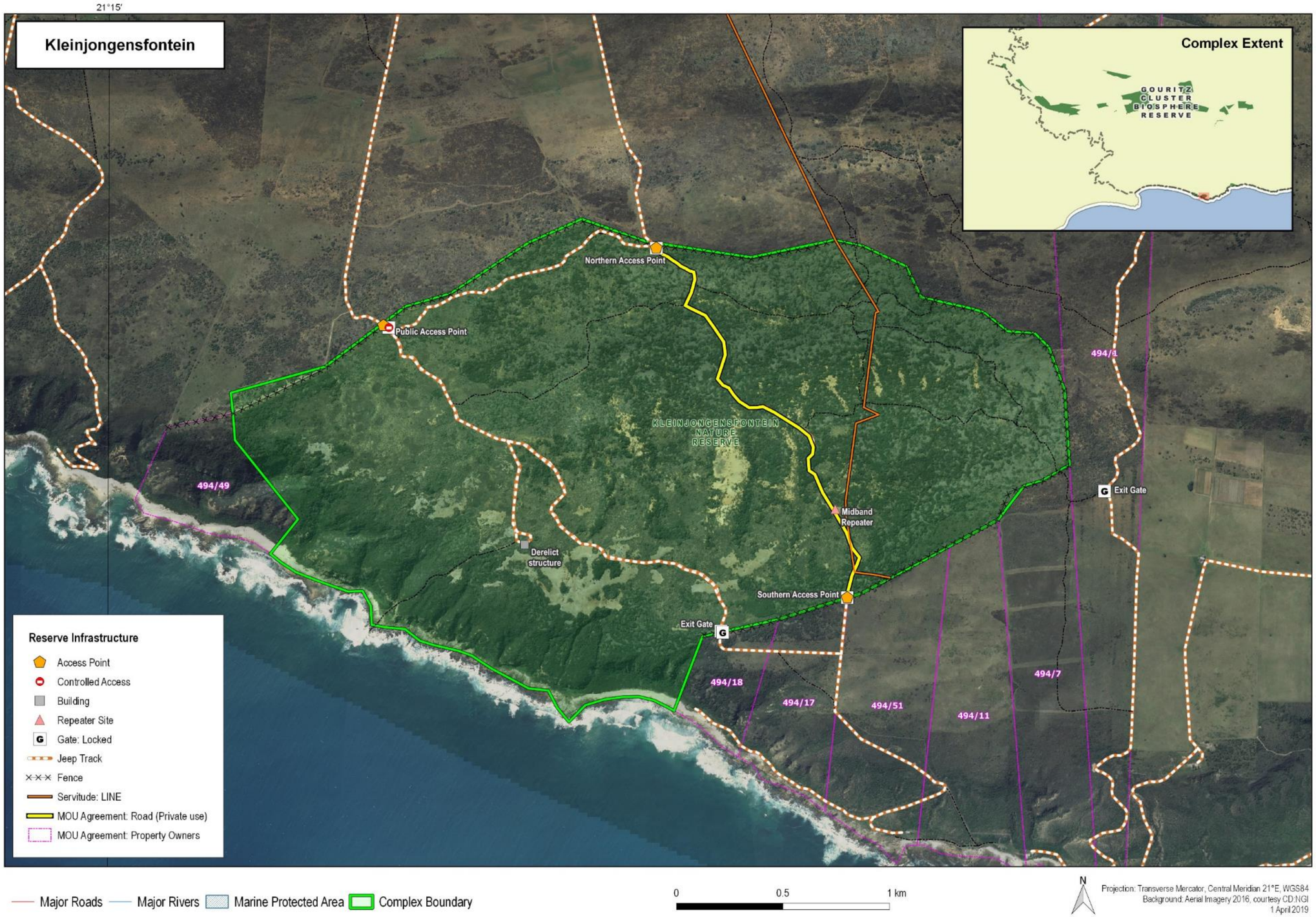
Map 12n: Infrastructure and servitudes on Blomboschfontein 2 Nature Reserves.



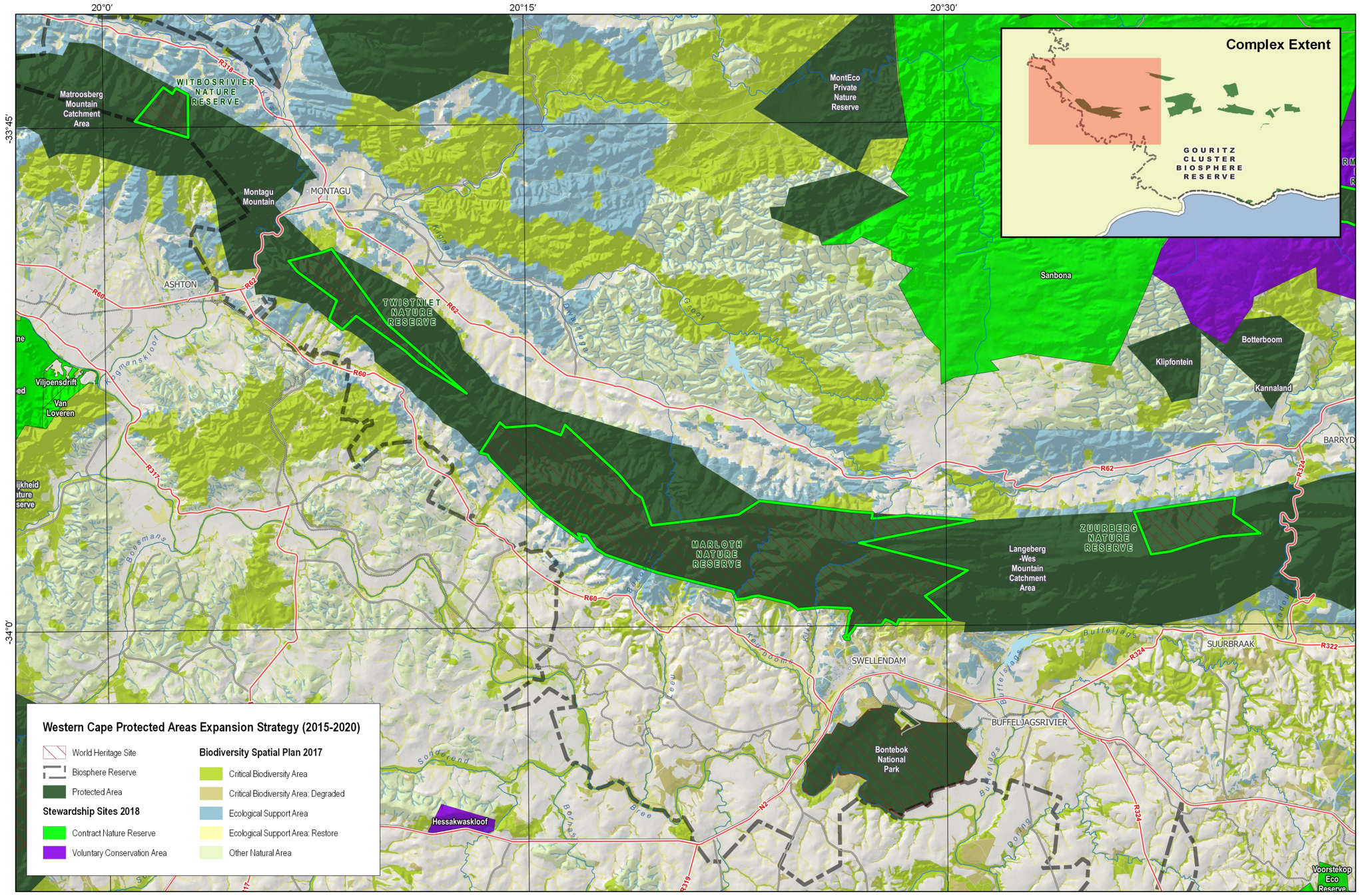
Map 12o: Infrastructure and servitudes on Geelkrans and Stilbaai-Oos Nature Reserves.



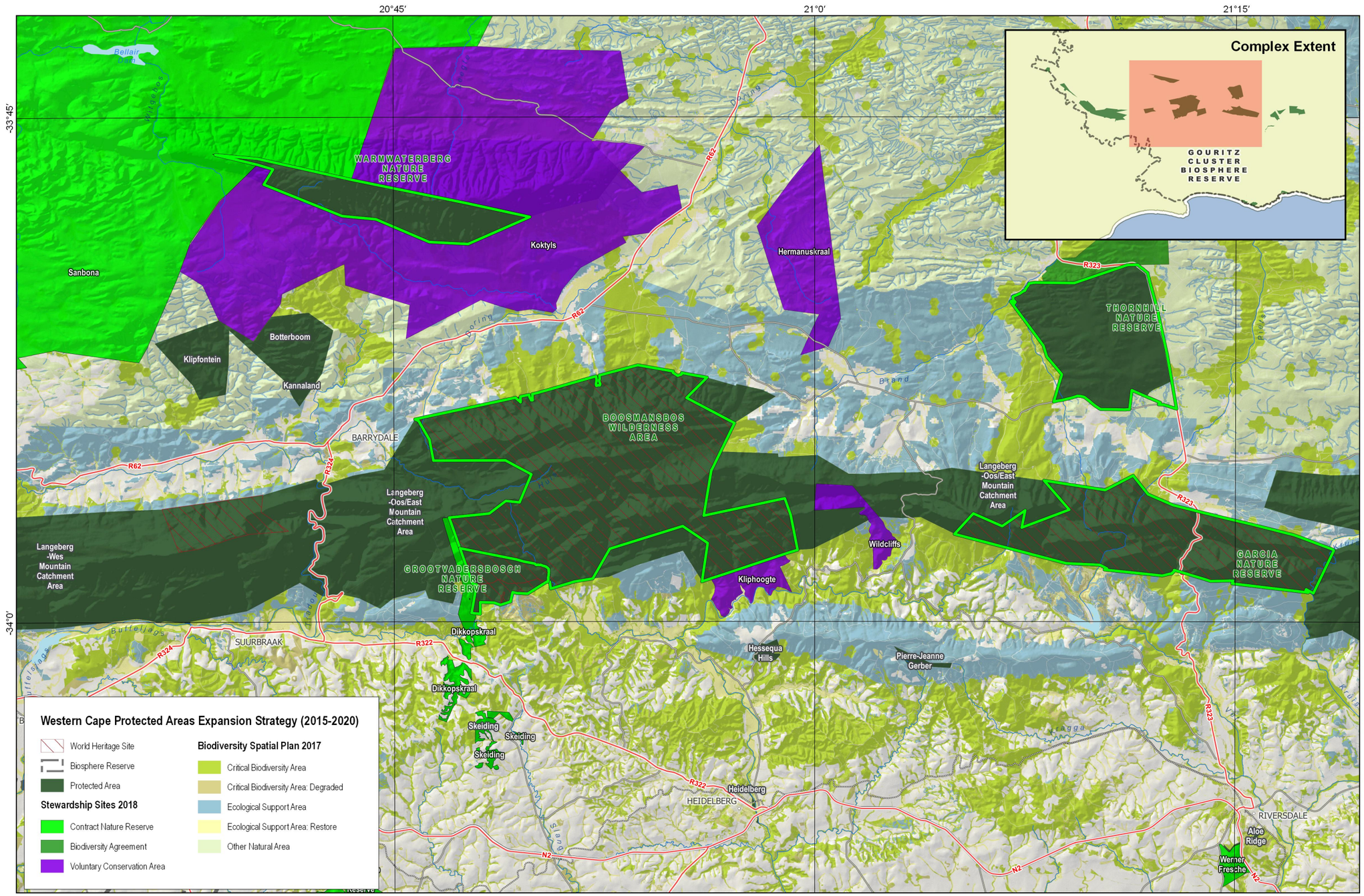
Map 12p: Infrastructure and servitudes on Kleinjongensfontein Nature Reserve.



Map 13a: Expansion of the Marloth Nature Reserve Cluster in the Langeberg Complex.

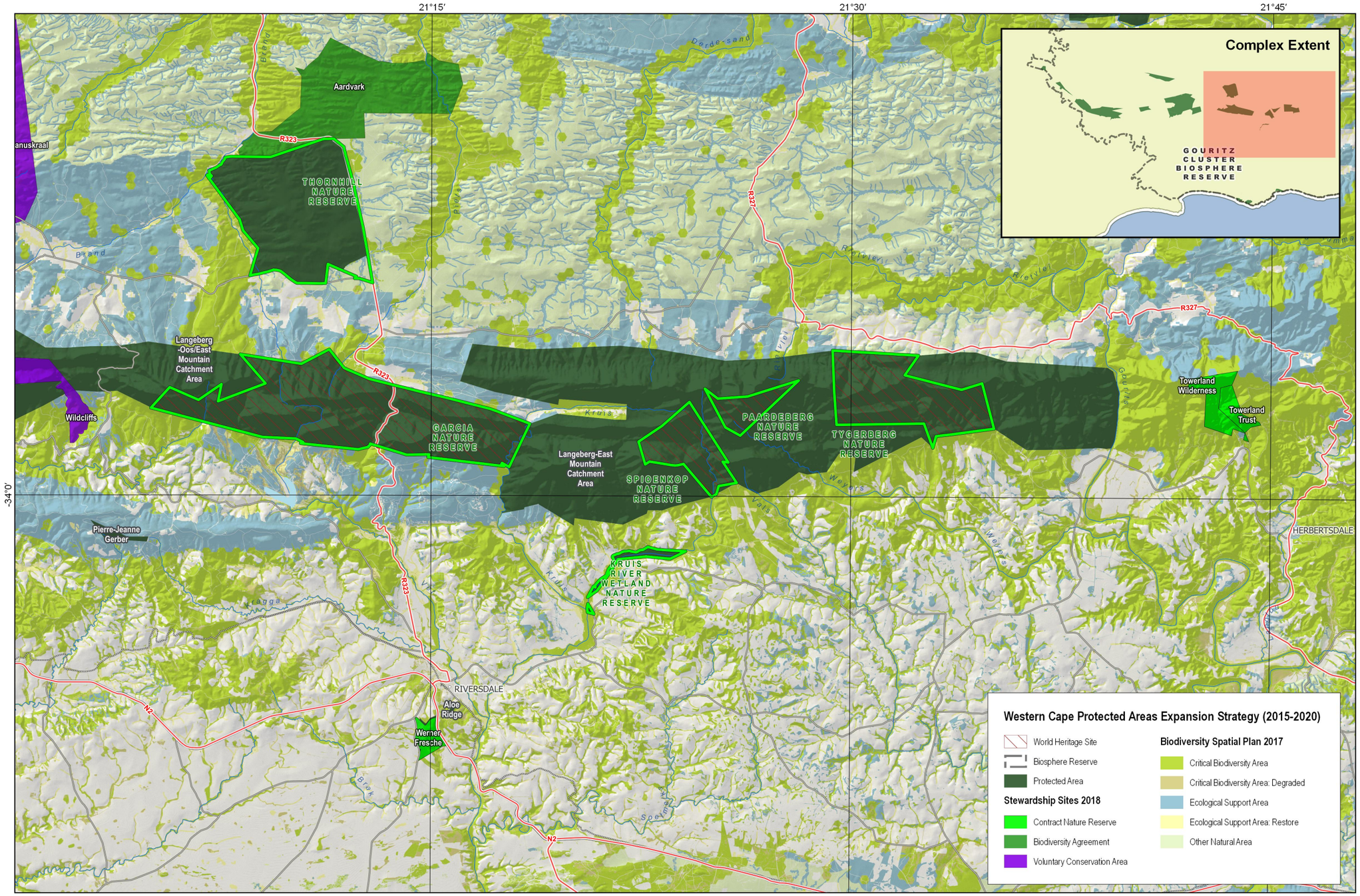


Map 13b: Expansion of the western section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex[1].



[1] Discrepancies with the mapping of reserve boundaries (e.g. Thornhill Nature Reserve) and protected area will be updated in the next version of the protected area expansion strategy.

Map 13c: Expansion of the eastern section of the Grootvadersbosch Nature Reserve Cluster in the Langeberg Complex[1].



[1] Discrepancies with the mapping of reserve boundaries (e.g. Thornhill Nature Reserve) and protected area will be updated in the next version of the protected area expansion strategy.

Map 13d: Expansion of the Geelkrans Nature Reserve Cluster in the Langeberg Complex.