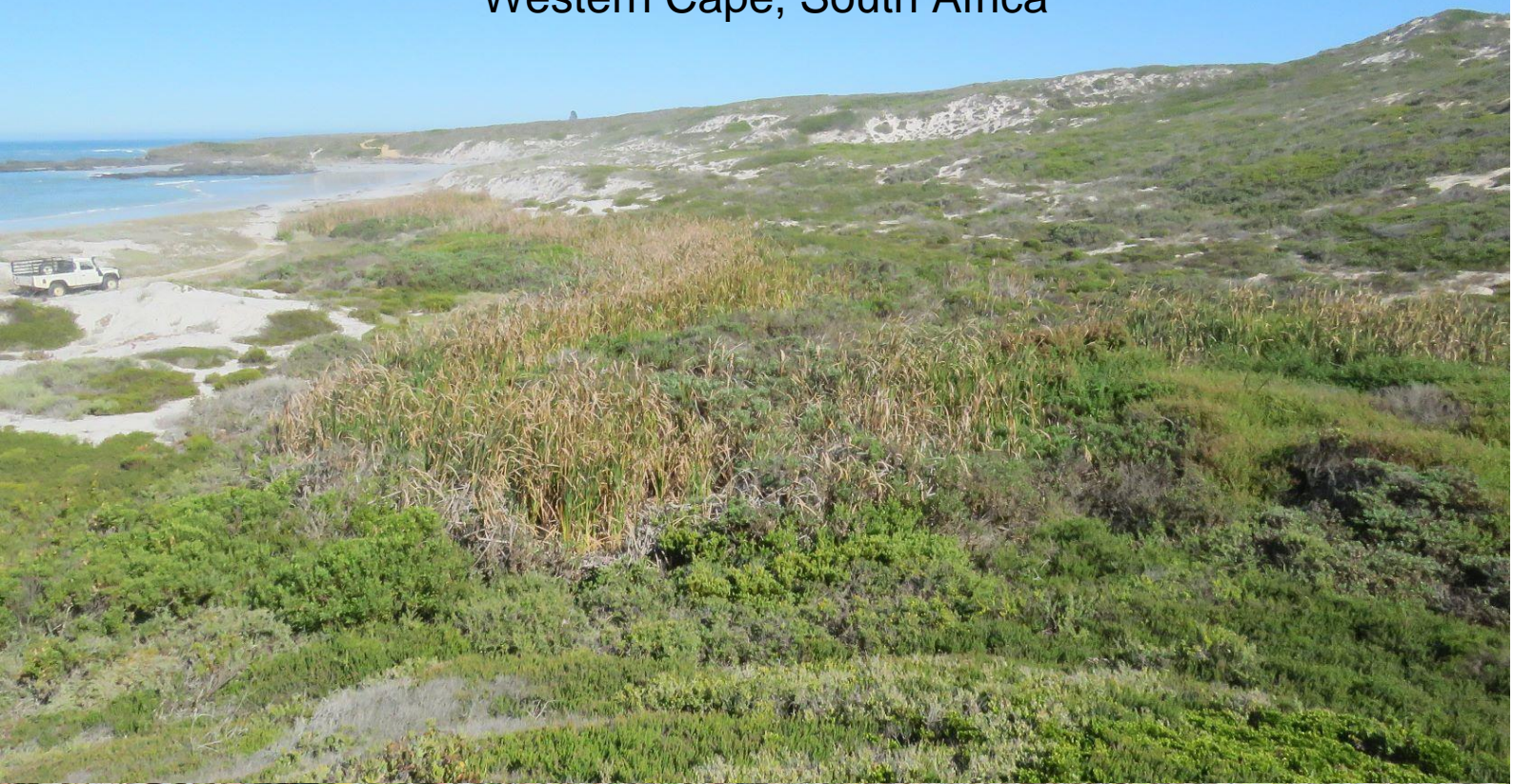


# **Bokbaai Nature Reserve**

Western Cape, South Africa



**Protected Area Management Plan**

**2023-2033**



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**Recommended citation:**

Bokbaai Nature Reserve Management Plan. Version 1.0, 2022.

**Management plan format:**

CapeNature, version August 2019

Protected area management plan format has been developed by CapeNature with input from external partners and industry stakeholders



The development of this revised management plan format has been funded by the Table Mountain Fund.



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This Protected Area Management Plan for the Bokbaai Nature Reserve was drafted and recommended by the Mapula Trust as the management authority.

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Review Date: November 2032

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## Abbreviations

<b>APO</b>	Annual Plan of Operation
<b>CBA</b>	Critical Biodiversity Area
<b>CFR</b>	Cape Floristic Region
<b>CMA</b>	Catchment Management Authority
<b>CR</b>	Critically Endangered
<b>DEA &amp; DP</b>	Department of Environmental Affairs and Development Planning
<b>DEA</b>	National Department of Environmental Affairs
<b>DoA</b>	Department of Agriculture Western Cape
<b>DWA</b>	National Department of Water Affairs
<b>EMP</b>	Environmental Management Plan
<b>EN</b>	Endangered
<b>ESA</b>	Ecological Support Area
<b>FEPA</b>	Freshwater Ecosystem Priority Area
<b>FPA</b>	Fire Protection Association
<b>IDP</b>	Integrated Development Plan (Municipal)
<b>KPA</b>	Key Performance Areas
<b>LC</b>	Least Concern
<b>LM</b>	Local Municipality
<b>LT</b>	Least Threatened
<b>MA</b>	Management Authority
<b>MCA</b>	Mountain Catchment Area
<b>MEC</b>	Member of the Executive Council
<b>MOA</b>	Memorandum of Agreement
<b>MOU</b>	Memorandum of Understanding
<b>NEM:BA</b>	National Environmental Management: Biodiversity Act
<b>NEM:PAA</b>	National Environmental Management: Protected Areas Act
<b>NEMA</b>	National Environmental Management Act
<b>NFEPA</b>	National Freshwater Ecosystem Priority Area
<b>NPAES</b>	National Protected Area Expansion Strategy
<b>NR</b>	Nature Reserve
<b>PAES</b>	Protected Area Expansion Strategy
<b>PAMP</b>	Protected Area Management Plan
<b>PBSAP</b>	Western Cape Provincial Biodiversity Strategy and Action Plan
<b>NR</b>	Nature Reserve
<b>SCC</b>	Species of Conservation Concern
<b>SDF</b>	Spatial Development Framework
<b>SMP</b>	Strategic Management Plan
<b>SPLUMA</b>	Spatial Planning and Land Use Management Act
<b>SDF</b>	Municipal Spatial Development Framework
<b>VU</b>	Vulnerable
<b>WCBSP</b>	Western Cape Biodiversity Spatial Plan
<b>WCD</b>	West Coast District
<b>WCPAES</b>	Western Cape Protected Area Expansion Strategy
<b>WWF - SA</b>	World Wide Fund for Nature – South Africa

# STRATEGIC MANAGEMENT PLAN

## 1. Background to the Management Plan

### 1.1 Purpose of the Plan

Management plans for privately owned protected areas are strategic documents that provide the framework for reserve development and operation. They inform management at all levels, from the landowner and reserve staff through to those responsible for management oversight within CapeNature. The development and use of a management plan creates continuity within the management structure thereby facilitating the achievement of set goals and objectives. The general objective of a management plan is to ensure the protection, conservation and management of the protected area concerned in a manner consistent with the objectives of the National Environmental Management: Protected Areas Act (No.57 of 2003) (NEM:PAA). A protected area management plan indicates where reserve management intends to focus its efforts in the next ten years. The management plan thus provides the long-term operational framework for the prioritised allocation of resources. The Bokbaai Nature Reserve (NR) is part of the Dassen Coastal Complex for which a protected area management plan was developed in 2019 (CapeNature, 2019). This management plan gives a broad overview of the complex in its entirety, yet management plans specific to each property and respective management authority within the complex are required. Each individual management plan should be in line with the broader aims and objectives for the complex as this will ensure management continuity within this protected landscape.

The purpose of the management plan for Bokbaai NR is to:

- Align Bokbaai NR management objectives with the management plan developed for the broader Dassen Coastal Complex.
- Provide the primary strategic tool for the management of Bokbaai NR in terms of biodiversity, natural and cultural historic heritage.
- Inform the need for specific programmes and operational procedures.
- Provide for capacity building, forward thinking, and continuity of management.
- Enable the landowner (Mapula Trust) to develop and manage Bokbaai NR in a manner that protects its values and the purpose for which it has been established.

Within the above context, the National Environmental Management: Biodiversity Act also requires that protected area managing authorities also produce an invasive species control plan. Invasive species management has therefore been addressed within this management plan at the level required to effectively manage invasive species and satisfy this legislative requirement.



## 1.2 Structure of the Plan

Section 1:	<b>Background.</b> Provides an overview of the guiding principles, aims and objectives for the management plan.
Section 2:	<b>NR Overview.</b> Establishes the context of the biodiversity stewardship site, providing the basis for the strategic management framework that follows.
Section 3:	<p><b>Strategic Management Framework.</b> Lays out the management authority’s high-level strategic decisions that guide the operational management of the reserve.</p> <p><u>Includes the:</u></p> <p><b>Purpose.</b> Defines the purpose of the management plan.</p> <p><b>Vision.</b> Defines the vision held for the protected area.</p> <p><b>Administrative structure.</b> Defines the power of the Management Authority and the relationship with CapeNature.</p> <p><b>Zonation plan.</b> Illustrates the different zones within the NR, as well as future developments.</p>
Section 4:	<b>Landscape Context.</b> Gives the ecological, as well as socio-economic context of the NR within its broader surrounds.
Section 5:	<b>Key Conservation Features.</b> Provides an overview of key features of conservation value in the protected area.
Section 6:	<b>Management Priorities.</b> Provides an overview of the most significant threats to ecosystem conservation in the protected area noted during fieldwork and explores opportunities to contribute to the broader conservation effort. These factors will help to determine the management objectives.
Section 7:	<b>Aims, Management Objectives under Key Performance Areas (KPA’s).</b> Defines the management objectives for the next 10 years and provides clear KPAs that enable measurement of progress toward achieving each objective.
Section 8:	<b>Operational Management Guidelines.</b> Sets out the management guidelines for managing the reserve.
Section 9:	<b>Implementing the Strategic Management Plan.</b> Describes how the Management Plan and the Annual Plan of Operation (APO), guides the operational implementation of management objectives laid out in this document.

### 1.3 Adaptive Management

The preparation of this management plan has been undertaken based on the guiding principles of adaptive management, which is a structured, iterative process in which decisions are made using the best available information, with the aim of continuously obtaining better information through ongoing research and performance monitoring (**Figure 1-1**). Adaptive management allows relevant information to be incorporated into the decision making and management process as, and when, it becomes available. In this way, decision making is aimed at achieving the best outcome based on current understanding, whilst accruing the information needed to improve future management. Adaptive management can lead to revision of a part or, if necessary, the entire management plan. Instead of waiting until a project is completed to determine whether the intervention was successful, adaptive management enables the managing body to ‘change direction’ when it becomes evident that management activities are not having the desired outcome.

Adaptive management enables landowners and managers to:

- Learn through experience;
- Plan to manage complexity in a changing environment towards predetermined outcomes;
- Continuously refine management processes to ensure the best possible management outcome;
- Monitor management effectiveness and adapt management actions based on tangible indicators;
- Efficiently adopt best practices and new innovations in biodiversity conservation management;
- Consult and engage with stakeholders;
- Demonstrate that management is appropriate and effective.



**Figure 1-1 The adaptive management cycle**

Management of protected areas requires a holistic yet strategic approach as there are numerous factors outside of the management bodies’ control that could influence the conditions of an ecosystem. The benefit of using

adaptive management for protected areas is that it provides a step-by-step process and follows a logical framework that works towards a predetermined goal. The management interventions are continually monitored to determine the progress made towards the desired outcome.

## 1.4 Guiding Legislation

### 1.4.1 National Environmental Management Protected Areas Act (NEMPAA)

There is a large body of legislation that is relevant to the management of nature reserves, but the primary legislation guiding the management of protected areas is the National Environmental Management: Protected Areas Act (Act 57 of 2003 – NEMPAA 2003 or ‘The Act’).

The Act establishes the legal basis for the creation and administration of protected areas in South Africa, as its objectives include provisions “for the protection and conservation of ecologically viable areas representative of South Africa’s biological diversity and its natural landscapes” (NEMPAA 2003). The Act sets out the mechanisms for the declaration of protected areas and the requirements for their management.

In the Western Cape, CapeNature is the Provincial Conservation Authority that facilitates the establishment of protected areas on private land and thereafter guides the management of the protected areas.

A detailed list of relevant legislation is provided in **Appendix A**. Landowners should familiarise themselves with the purpose and contents of the statutes and their subsequent amendments and regulations.

#### 1.4.1.1 Purpose of Declaring Protected Areas

According to S17 of NEMPAA, the purpose of declaring an area as a protected area are:

- i) to protect ecologically viable areas representative of South Africa’s biological diversity and its natural landscapes and seascapes in a system of protected areas;
- ii) to preserve the ecological integrity of those areas;
- iii) to conserve biodiversity in those areas;
- iv) to protect areas representative of all ecosystems, habitats and species naturally occurring in South Africa;
- v) to protect South Africa’s threatened or rare species;
- vi) to protect an area which is vulnerable or ecologically sensitive;
- vii) to assist in ensuring the sustained supply of environmental goods and services;
- viii) to provide for the sustainable use of natural and biological resources;
- ix) to create or augment destinations for nature-based tourism;
- x) to manage the interrelationship between natural environmental biodiversity, human settlement and economic development;
- xi) generally, to contribute to human, social, cultural, spiritual, and economic development; or
- xii) to rehabilitate and restore degraded ecosystems and promote the recovery of endangered and vulnerable species.

## 1.4.2 Other Key Legislation

The majority of legislation in South Africa could be applicable within Bokbaai NR and cannot be covered here in full. The provisions of several key acts and regulations should be noted however as these apply commonly to reserve management activities. It is recommended that the managing authority familiarise themselves with these legislative instruments as per the sections below. Additional acts and regulations that may be of significance to the reserve are listed in **Appendix A**.

### *Development Activities*

The National Environment Management Act (NEMA – Act 107 of 1998) provides a framework for all other environmental legislation in South Africa, and the other national environmental acts are considered Specific Environmental Management Acts (SEMAs), promulgated in terms of the NEMA. The NEMA furthermore defines the requirements and procedures for securing Environmental Authorisation via the Basic Assessment and full Environmental Impact Assessment processes. Activities, with thresholds where applicable, that require Environmental Authorisation are listed in Listing Notices 1, 2 and 3 (GNR 327, 325 and 324 of 2017, respectively), while GNR 326 of 2017 regulates the Environmental Impact Assessment process. These regulations are updated regularly and the latest regulations should always be kept on file.

While all generally applicable listed activities may apply to future development activities at Bokbaai Nature Reserve, those applicable to specifically to Protected Areas (mainly in Listing Notice 3), to the Coastal Zone (e.g. Listing Notice 1, Activities 15, 18, 52, 55 and Listing Notice 2, Activity 26), and to the clearance of indigenous vegetation (Listing Notice 1, Activity 27; Listing Notice 2, Activity 15; Listing Notice 3, Activity 12). If in doubt as to whether an activity requires Environmental Authorisation, it is best to submit an environmental checklist to the Department of Environmental Affairs and Development Planning who administer the NEMA in the Western Cape.

See also the sections below relating to coastal management and water use, which may be relevant to development activities.

### *Floral and Faunal Management*

Section 73 of the National Environmental Management Biodiversity Act (NEMBA – Act 10 of 2004) requires that landowners control listed alien invasive vegetation on their land, so as to minimise harm to biodiversity and prevent spread to neighbouring properties. The NEMBA further makes provision for both administrative and statutory enforcement measures should alien invasive species be allowed to proliferate. Section 76 (1), which pertains to invasive species control plans of organs of state indicates that: “The managing authority of a protected area preparing a management plan for the area in terms of the Protected Areas Act must incorporate into the management plan an invasive species control and eradication strategy.” It is unclear whether this provision can be applied to protected area managing authorities that are not an organ of state, but it is an essential part of protected area management and will therefore be included in this PAMP.

The NEMBA also lists certain species of plants and animals which are protected. These lists overlap to a large degree with the Convention on International Trade in Endangered Species (CITES) lists and give effect to South Africa’s obligations under the Convention. Operations involving protected species may require authorisation in terms of the NEMBA. The species in question are unlikely to feature in the management of Bokbaai NR, but it is



recommended that reserve management become familiar with the NEMBA lists and any restrictions or authorisations that may apply. The lists and regulations may be updated from time to time and could possibly apply in the future.

A wider list of species (including many indigenous and certain alien invasive frogs, toads, reptiles and birds) is protected in terms of the Western Cape Nature Conservation Ordinance (19 of 1974). This includes the requirement for permits to hunt or transport a wide variety of faunal and floral species. Any species relocations or population control should be discussed with CapeNature (who administer the Ordinance) to determine whether permits are required.

### *Fire*

The Veld and Forest Fire Act (Act 101 of 1998) requires that a landowner install reasonable fire breaks on the edge of their property and undertake reasonable firefighting effort should a wildfire start on their property, unless otherwise stipulated in an agreement with neighbouring landowners drafted as part of the establishment of a Fire Protection Association. Failure to do so may result in the landowner being liable for neighbouring landowners' costs due to damages by the fire or incurred on while fighting such a fire. It is highly recommended that Bokbaai NR maintain membership of the applicable Greater Cederberg Fire Protection Association that is active in this area.

### *Heritage*

Heritage resources are primarily governed by the National Heritage Resources Act (Act 25 of 1999 – NHRA) and this is the act under which the historical infrastructure node within the nature reserve has been declared as a Provincial Heritage Site (Grade II) with registration number 9/2/060/0022. It was originally declared as a National Monument in 1971 in terms of the National Monuments Act (Act 28 of 1969) which was later repealed by the NHRA.

Restoration or maintenance activities may require authorisation from Heritage Western Cape. Restrictions on construction and maintenance methodologies designed to conserve the heritage value of the heritage buildings and resources on site may be expected.

### *Security/Enforcement*

While education and other soft approaches to visitor management should be the primary means of ensuring that visitor behaviour is in line with relevant legislation and does not undermine implementation of the management plan, there may be instances where more decisive action is appropriate and necessary. In such a situation it is essential to understand the extent and limits of the power granted to a land/property owner in terms of the Criminal Procedures Act (Act 51 of 1977 – 'the CPA').

The CPA makes provision for any private individual to make an arrest anywhere and at any time for any offence listed in terms of Schedule 1 of the CPA. This schedule contains 25 serious offences such as murder, assault, robbery, kidnapping, arson, breaking and entering, malicious damage to property and theft, along with conspiracy, incitement or attempt to commit any such offence. The CPA further makes provision for a private individual to make an arrest for any offence on or in respect of any property (land or any other asset) that they own, lawfully

occupy or are in charge of. This is further extended to anyone authorised by such a person for this purpose. In the context of Bokbaai NR, this provision bestows all representatives of the Mapula Trust and anyone else authorised thereby with broad powers of arrest. These powers are further extended to include search and seizure of stolen goods, or goods that are unlawfully possessed, such as illicit drugs, on the premises concerned.

Arrest, search and seizure are actions that are fraught with potential legal pitfalls however, and it is extremely important that any person empowered or instructed to undertake such actions on behalf of the Mapula Trust be adequately trained and familiar with the appropriate procedures indicated in the CPA, including informing the suspect of their rights and the appropriate use of force to affect an arrest. Affecting an arrest or undertaking a search wrongfully or in an incorrect manner may result in criminal charges for the arrestor and may result in liability or additional charges for the Mapula Trust. It is therefore important that the Mapula Trust put clear safeguards in place if these powers are exercised or delegated to nature reserve staff. These could include limitations (e.g. only attempt arrests under specific circumstances, and refrain from search and seizure) or procedures (e.g. staff require authorisation from Mapula Trust to exercise powers of arrest, search or seizure).

### *Coastal Management*

The National Environmental Management: Integrated Coastal Management Act (NEMICMA, Act 24 of 2008) is in place to ensure the coastal environment is protected and maintained and that development in the coastal zone is socially and economically justifiable and ecologically sustainable. To this end, it ensures that the coastal zone is managed in such a way as to protect the ecological integrity, natural character and the economic, social and aesthetic value of coastal public property, and to ensure the protection of people, property and economic activities from risks arising from dynamic coastal processes and sea-level rise.

Bokbaai Nature Reserve falls under the definition of a “Coastal Protected Area”, which means that the entire nature reserve forms part of the “Coastal Zone” and is therefore governed by the NEMICMA. The landowner must become familiar with the requirements of the NEMICMA, particularly the sections pertaining to public access to the coastal zone, the National Estuary Management Protocol, the Coastal Management Programme and those pertaining to land-use in the coastal zone.

### *Waste*

According to the National Environmental Management: Waste Act (NEMWA - Act 59 of 2008) the generation of waste must be avoided and where such generation cannot be avoided the toxicity and amounts of waste that are generated should be minimised. Waste should be reduced, re-used, recycled and recovered where possible. Waste must be stored in an appropriate location and containers approved by the municipality. Waste must be sorted in such a way as to prevent leaking, spillage and the general pollution of the environment. The NEMWA stipulates requirements for the safe storage of waste including permit requirements for particular volumes of waste of different classes. Mapula Trust must ensure that:

- Waste must be reduced, re-used and/or recycled as far as possible,
- Waste generated on site is stored as per the NEMWA and its regulations,
- Allowable quantities of each waste class are not exceeded,
- Waste is taken to landfill facilities that are licenced to accept the relevant waste class.

### *Water use*

The National Water Act (NWA – Act 36 of 1998) governs all use of water, including conventional consumptive uses such as abstraction for consumption or irrigation, along with less obvious non-consumptive uses such as irrigation with treated effluent (which is a regulated activity), discharging water containing waste (e.g. outflow of the onsite Waste Water Treatment Works) or altering the “bed, banks, characteristics” or “flow” of a watercourse. Its regulations go so far as to define a regulated zone of 500 m around wetlands and of 100 m around drainage lines within which the latter uses require a water use authorisation. All proposed water uses, be they consumptive or non-consumptive, should be assessed to determine whether authorisation is required before proceeding with their implementation.

### 1.4.3 Declaration Status of Bokbaai Nature Reserve

The privately-owned farm Bokkerivier, was declared, according to Section 23 of the NEM:PAA, as the Bokbaai Nature Reserve on the 26 March 2019.

The cluster of historical buildings within the farm was declared a National Monument according to Section 10(1) of the National Monuments Act (Act No. 28 of 1969) in 1971. When the National Monuments Act was repealed by the SAHRA in 1999, the heritage classification was changed to Provincial Heritage Site (Grade II).

Declaration Type	Declaration Date:	Government Gazette Notice:
Nature Reserve	26 <sup>th</sup> of March 2019	Gazette No. 8070 of 2019
Provincial Heritage Site (Grade II)	19 <sup>th</sup> of November 1971	Gazette No. 3309 of 1971

See **Appendix B** – Copy of Bokbaai Nature Reserve and Heritage Declaration Notices.



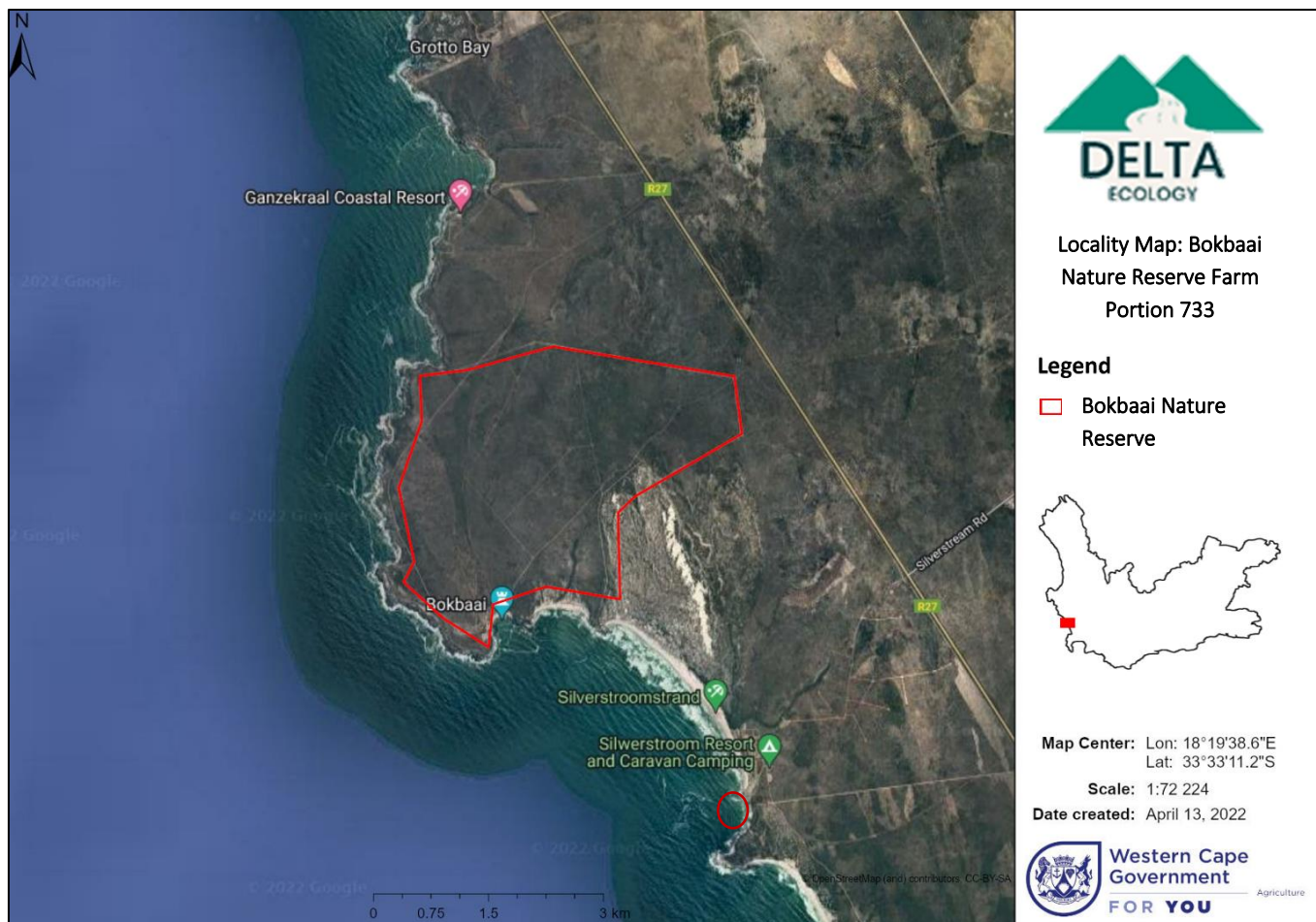
## 2. Bokbaai Nature Reserve Overview

### 2.1 Introduction

Bokbaai NR is situated on the West Coast of South Africa, in the Western Cape Province (**Figure 2-1**). The reserve is located approximately 4 km south of Grotto Bay and 35 km southwest of Malmesbury, on the farm Bokkerivier No. 733 within the Swartland Local Municipality. The farm is accessed via an existing road leading off the R27. The reserve is approximately 1077,5 ha in extent and consists primarily of natural vegetation with limited infrastructure. The infrastructure within the reserve consists of an environmental education centre, a homestead, cottage, staff and researchers' accommodation, a storage room, campsite, and ablution facilities.

According to the SANBI 2018 National Vegetation Map, the natural vegetation type of the property consists mainly of Atlantis Sand Fynbos with some areas of Cape Flats Dune Strandveld and Langebaan Dune Strandveld also present. Atlantis Sand Fynbos is classified as Endangered (EN) and narrowly distributed with evidence of ongoing biotic disruption from invasive species and overgrazing (SANBI 2022), while Cape Flats Dune Strandveld is Endangered (EN) and narrowly distributed with high rates of habitat loss, and evidence of ongoing biotic disruption from invasive species (SANBI 2022), and Langebaan Dune Strandveld is of Endangered (EN) and narrowly distributed with evidence of ongoing biotic disruption from invasive species and overgrazing (SANBI 2022)

The Bokbaai NR lies between the Atlantic Ocean and CapeNature's Ganzekraal Conservation Area. It forms part of the Dassen Coastal Complex for which CapeNature recently developed a Protected Area Management Plan. The farm Bokkerivier was proclaimed as a protected area as it is a Provincial Heritage Site (Grade II), containing threatened ecosystems. Furthermore, it forms part of the strategic landscape of the Dassen Coastal Complex which "supports the largest remaining intact and ecologically viable examples of several threatened lowland ecosystems" (CapeNature, 2019) including intact terrestrial, freshwater, and marine ecosystems, important fauna and flora habitats, and a rich history with onsite heritage features.



**Figure 2-1 Regional Location of Bokbaai Nature Reserve**

## 2.2 Property History

Farm Bokkerivier No. 733 has a rich history stretching as far back as pre-colonial times. This land was originally used for pasture by the indigenous Koina herders, and as hunting grounds by the Sonqua hunter gatherers. Beach rangers also used to gather fish and other seafood from along the shores of Bokbaai. Evidence of these pre-colonial activities have been found in the form of human remains, shell middens and artefacts such as pieces of clay pots, stone tools, arrowheads, and ostrich shell beads (Winter & Baumann, 2017).

The written history of this region starts in approximately 1652 when it was used as a maritime replenishment station with agreements existing between the Dutch East India Company and the indigenous occupants of the land (Winter and Baumann, 2017). This land was later divided into sections, with one of these sections being the farm of Bokkerivier. This farm was used for the raising of cattle and later rented out to the Van Reenen brothers, who were long established contracted butchers and used this land for grazing and burned lime. They also established the Bokbaai farmstead. The homestead, a long outbuilding, the structure referred to as the old “jail,” and a cottage located on the property were built in late 18<sup>th</sup> to early 19<sup>th</sup> century, while the stables were built in the 20<sup>th</sup> century (Winter & Baumann, 2017).

The largescale development that accompanied the colonisation of Cape Town required significant amounts of building lime which was obtained by burning seashells. Robben Island was the original source of seashells for lime production and when this source was depleted, Bokbaai became the new supplier (Winter & Baumann, 2017). Lime production took place on the Bokkerivier farm from 1811 to 1827. Many buildings in Cape Town

including the Company Gardens were likely built using Bokkerivier lime. In 1819, a large ship, the *Isabella*, which was used for the transport of wheat, was wrecked and historic accounts indicate that Bokbaai was the location of this wreckage (Winter & Baumann, 2017).

From 1846 this farm was transferred into private ownership and was kept in the Duckitt family from 1870 to 2001, who kept sheep, but otherwise acted to conserve the land. In the 1970's an attempt was made by the National Party to declare the farm part of a Coloured Group Area. However, due to the growing acknowledgement of the farm's blend of architectural and natural beauty as well as its mysterious history, it was declared a National Monument and thus exempt from this act (this was not without a significant public political debate however) (Winter & Baumann, 2017). Bokkerivier was acquired by a German developer in 2001 and after his death in 2010 the property was placed on the market again. The Mapula Trust purchased the Bokkerivier farm in 2015. With its remarkable history and biodiversity, this property was seen as the ideal site for conservation and the establishment of an environmental education centre which was developed in 2017.

## 2.3 Property Details

Bokbaai NR is located on Farm Bokkerivier No. 733 which is owned by the Mapula Trust. CapeNature has a Protected Area Management Agreement with Mapula Trust for the integrated management of the nature reserve. The property details are shown in Error! Reference source not found. below.

**Table 2-1 Property Details of the Bokbaai Nature Reserve**

Landowner & Management Authority	
Landowner	Mapula Trust
Contact Person	Michael Byron
Contact Details – Telephone Number	021 689 6103
Contact Details – Email Address	Michaelbyron02@gmail.com
Property Details	
Property Description	Farm Bokkerivier No. 733, in the Swartland Municipality, Division of Malmesbury, Western Cape Province, measuring 1077,5173 ha in extent; Held by Deed of Transfer No. T24425/2015. SG Code: C04600000000073300000.
District Municipality	West Coast
Local Municipality	Swartland
Total Conservation Area	1077,5173 ha

### 3. Strategic Management Framework

The strategic management framework is aimed at providing the basis for the protection, development, and operation of the protected area over a ten-year period. It consists of the vision, purpose, administrative structure, and zonation of Bokbaai Nature Reserve. It has been prepared collaboratively through a process involving the landowner (Mapula Trust), site manager, and CapeNature.

#### 3.1 Purpose

The purpose is the foundation on which all future management actions are based and is in line with the key ecological attributes of the reserve, the overall management philosophy of the management authority and the objectives of the NEM:PAA. The priority focal areas for the Dassen Coastal Complex include the protection of lowland Fynbos mosaics, natural wetlands, and historic structures. These features will therefore be included as priorities in the management of the Bokbaai NR.

The purpose of the Bokbaai Nature Reserve within its jurisdiction is:

- i) to protect ecologically viable areas representative of critically endangered Atlantis Sand Fynbos, endangered Cape Flats Dune Strandveld and endangered Langebaan Dune Strandveld, thereby contributing to conserving South Africa's biological diversity and its natural landscapes and the achievement of conservation targets required in terms of international obligations;
- ii) to preserve the ecological integrity of the area within Bokbaai Nature Reserve ;
- iii) to conserve biodiversity in the area within Bokbaai Nature Reserve;
- iv) to protect rare or threatened species within Bokbaai Nature Reserve;
- v) to rehabilitate and restore degraded ecosystems and promote the recovery of threatened species;
- vi) to protect the cultural and historic resources of the region;
- vii) to contribute to landscape continuity and prevent future habitat fragmentation;
- viii) to provide opportunities for nature-based tourism and/or environmental education;
- ix) generally, to contribute to environmental, human, social, cultural, and spiritual development.

#### 3.2 Vision

The vision statement for the Bokbaai PNR below describes the desired long-term, over-arching outcome that results from the effective management of the reserve.

Vision:

A near-pristine natural environment with intact, high-quality terrestrial, freshwater, and coastal habitats in which native biodiversity thrives, where ecological resilience is promoted under changing environmental conditions, and where the unique beauty and cultural heritage of the area is preserved to educate and inspire underprivileged youth.



### 3.3 Administrative Structure

It is important that all reserve management plans clearly define the roles and responsibilities for management and the mechanisms by which the various role-players may exercise their responsibilities. This promotes cohesion and minimises potential for conflict. The roles and responsibilities for the Bokbaai NR are as follows.

#### 3.3.1 The Managing Authority

The landowner, Mapula Trust, is the managing authority responsible for implementation of this management plan. Mapula Trust commits to the allocation of budget and the application of effort, as far as is reasonably possible, to implement the management measures indicated in this plan. This may include appointment of a reserve staff and/or contracted implementing agents to enact defined portions of the management plan or to implement the plan in full, along with the provision of tools, equipment, consumables and other resources. It will also entail setting priorities, providing daily tasks and ensuring that tasks are completed as per the management plan.

The Mapula Trust is responsible for submitting a progress report annually to the oversight authority that details progress made in implementing this management plan, along with any challenges, setbacks or new concerns encountered. The Mapula Trust is furthermore responsible for submission of this management plan for entry into the Government Gazette and subsequent updating of the management plan subject to the provisions of Section 3.3.2 below.

#### 3.3.2 Oversight Authority

CapeNature will be responsible for ensuring that the approved management plan is in line with the purpose and requirements for a nature reserve as stipulated in the NEM:PAA and its regulations, along with relevant provincial legislation, policies or plans which have been adopted by the Western Cape Government. CapeNature will furthermore oversee the management of the nature reserve to ensure that it is in line with the approved management plan. Mechanisms for oversight may include scheduled site inspections, review of annual progress reports and auditing by means of appropriate management effectiveness review methods. CapeNature will furthermore review any updates to this management plan proposed by the managing authority and approve or reject these changes and may make recommendations where necessary.

### 3.4 Zonation Plan

CapeNature's protected area zonation categories provides a standardised framework for managing land use across protected areas. It allows for reserves to be divided into various use zones, each with a different purpose, based on a sensitivity analysis. The most sensitive areas may be designated "wilderness" or "primitive" zones which may allow for very little or no development. Previously disturbed areas such as historically ploughed fields may be designated as "Low Intensity" or even "High Intensity" development zones which would allow for a variety of activities. These activities may include development of visitor infrastructure, harvesting of resources or other activities that maximise the human benefit derived from the reserve.

CapeNature's zonation categories (**Table 3-1**) were developed through an internal workshop process completed in September 2010. Existing protected area zoning categories worldwide were examined to develop a simple and powerful scheme that provides for the required range of visitor experience, access, and conservation

management. The zonation categories is a core component of any protected area management plan as it provides a spatial context for achieving the vision and objectives set for the protected area.

The purpose of the zonation plan for Bokbaai Nature Reserve is to utilise the CapeNature zoning categories to align land-use with the vision for the protected area. The zonation plan therefore needs to cater for:

- Conservation and rehabilitation of terrestrial, freshwater and coastal habitats, with emphasis on the most threatened species and ecosystems;
- Maximising climate change resilience;
- Providing room for rational development of facilities for reserve management and environmental education;
- Providing facilities for nature-based environmental education activities;
- Providing reasonable access to the coast for existing user groups and to the reserve generally for management purposes.

Much of the Bokbaai NR consists of near-pristine Endangered or Critically Endangered habitat. The Critically Endangered Atlantis Sand Fynbos habitat is concentrated in the eastern half of the reserve. The western half is dominated by ecotonal strandveld between the Endangered Cape Flats Dune Strandveld and the Least Threatened Langebaan Dune Strandveld. Large areas of the reserve exhibit a mosaic of fynbos and strandveld vegetation types and this is likely to be associated with high species diversity. See Helme, et al. 2016 and 2017.

Existing infrastructure is tightly clustered around the historical buildings in the southwest, with outlying infrastructure and previously disturbed areas (such as the dam, borehole, water treatment plant, public parking areas and a historically ploughed field) largely confined to the western half of the reserve. The primary access road to the main infrastructure node and to the coast (which was historically proclaimed as a public road or Farm Access Servitude) is also situated in the west. Apart from sand tracks and the boundary fence, the only infrastructure present in the eastern parts of the reserve is a disused concrete reservoir.

All parts of the reserve should be considered sensitive to a certain degree given the uniqueness and conservation status of the dominant ecosystems and the heritage value present. It is possible however to define areas of greater or lesser sensitivity. The eastern half of the reserve exhibits a higher degree of sensitivity. The western half is less sensitive, but remains sensitive and important on a national scale. The main and outlying infrastructure nodes, along with the previously ploughed field, would be considered the least sensitive due to the degree of disturbance and transformation. The outlying infrastructure and ploughed field are however couched within areas of high sensitivity and due regard must be taken to minimise impact on the surrounding habitat. The main infrastructure node lies partially within the active coastal zone, which is highly sensitive, and much of the infrastructure within the node has very high heritage value that must be maintained.

Given the scale of the site, the presence of management tracks, fences and similar infrastructure, the most sensitive area in the eastern half of the reserve cannot be considered a wilderness area. However, given that the infrastructure is minimal and that the habitat is of such high quality, it has been designated as “Primitive”. The western half of the reserve, which contains the majority of the infrastructure and is dominated by relatively less sensitive vegetation has been designated as a “Nature Access” zone. This allows for a higher degree of visitor access (including for coastal access along the public road), infrastructure for environmental education activities and a greater density of internal roads for accessing outlying reserve infrastructure (such as the borehole and

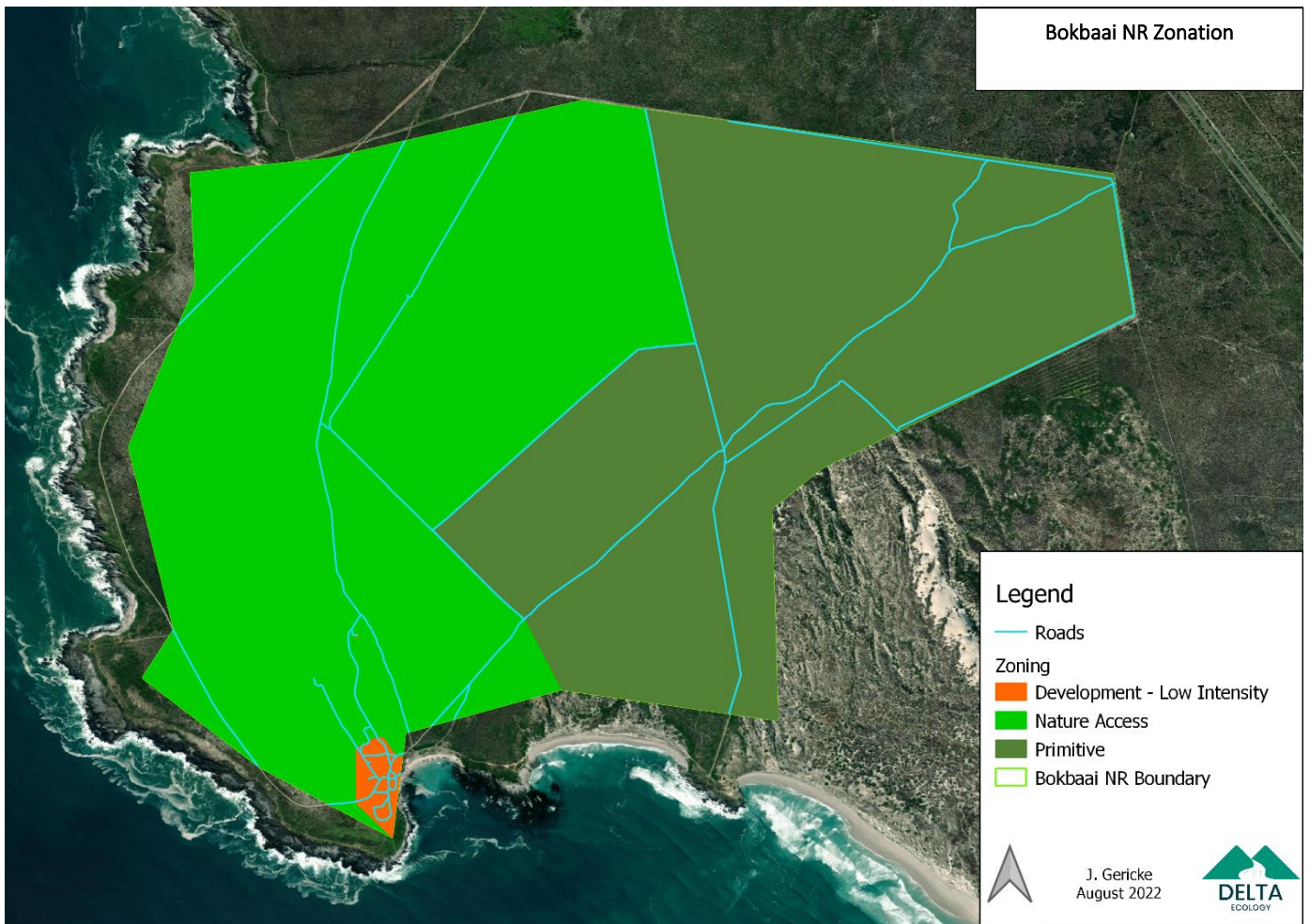
water treatment plant), while still ensuring minimal habitat disturbance and allowing for significant focus on rehabilitation and conservation.

The main and outlying infrastructure nodes have been designated as Low-Intensity Development zones, allowing for construction and retention of the infrastructure necessary for environmental education and reserve management activities. Restoration of natural vegetation between roads and buildings, albeit in an orderly, landscaped fashion is nonetheless required, along with retention/enhancement of heritage value where possible. Although the dam and the historically ploughed field could be considered infrastructure and therefore suitable sites for development of reserve facilities, they are not situated in opportune locations for development. No infrastructure is planned for either site, outside of that allowed by the “Nature Access” zonation of the surrounding area. The dam is also effectively an excavated portion of a natural wetland and therefore lies within a particularly sensitive habitat feature. Consequently they have not been separated from the surrounding area and have been included in the “Nature Access” zone. The zone boundaries were defined along existing roads or tracks as far as possible for the sake of practicality.

The zonation map (**Figure 3-1**) and **Table 3-1** illustrate the different zones within the reserve and provide descriptions of these zones. More detailed descriptive information is provided in **Appendix C**. The factors that were taken into account in assessing the reserve sensitivity and defining the zonation categories are clarified in more detail in the descriptive sections that follow.

**Table 3-1: Guide to CapeNature Conservation Management Zones**

Zonation Category	Explanation
Wilderness/ Wilderness Declared	Areas with pristine landscape, sensitive areas or threatened ecosystems. Very limited access.
Primitive	Areas providing natural landscape, solitude and limited access. Normally a buffer area to wilderness zones.
Nature Access	Providing easy access to natural landscape. Includes areas with roads and trails, and access to popular viewing sites and other 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 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 and management.
Development - Production	Commercial or subsistence farming (applicable to privately owned and managed nature reserves).
Development – Private areas	Private dwellings and surrounds (only applicable to privately owned and managed nature reserve).
Species/Habitat/Cultural Protection	Areas for protection of species or habitats of special conservation concern.
Cultural, Species / Habitat, Visual Natural Resource Access	Special management overlays for areas requiring specific management interventions within the Species / Habitat / Cultural Protection Zone.



**Figure 3-1: Zonation map of Bokbaai Nature Reserve**

## 4. Landscape Context

### 4.1 Ecological Context

This section describes the ecological components and drivers that influence biodiversity and ecological processes at Bokbaai Nature Reserve.

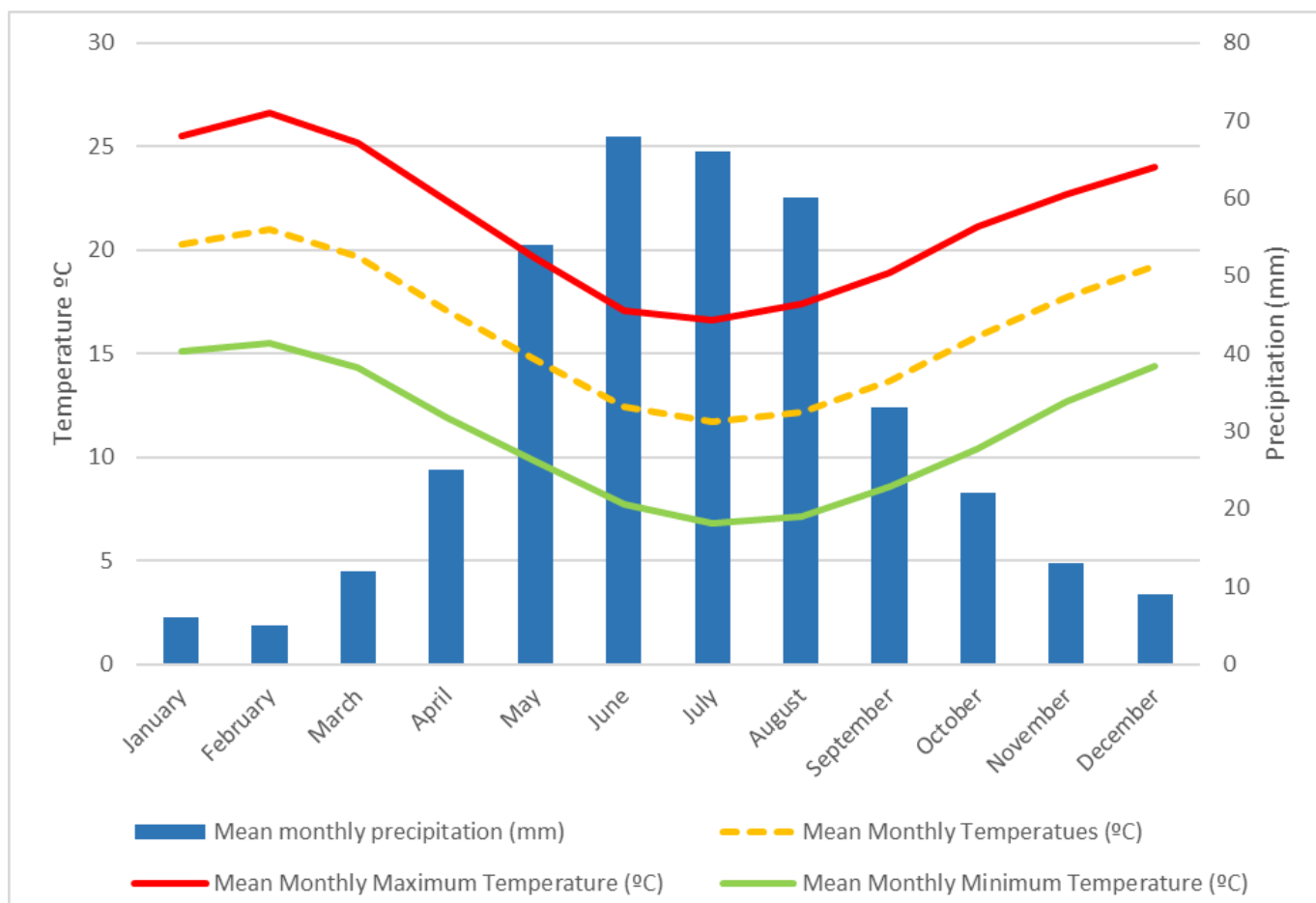
#### 4.1.1 Climate

The Bokbaai NR experiences a temperate, Mediterranean climate characterised by warm, dry summers and cool, wet winters. The climate of Bokbaai NR is influenced by its location along the West Coast of South Africa. The reserve is set on a peninsula that extends approximately 2 km into the Atlantic Ocean where the cold upwelled water of the Benguela current has a moderating effect on the temperatures, with the peninsula being 3 to 5 °C cooler than areas inland of the R27. Maximum temperatures in the NR are experienced in February with mean daily temperatures of 21°C, while minimum temperatures are usually experienced in July with mean daily temperatures of 11.7 °C (Schulze, 2009). During the winter months the northerly and north westerly winds that predominate bring rain, while in the summer southerly and south westerly winds are most common. The south-easterly winds push water away from the coastline via Eckman transport, causing Central Water from a depth of over 1000m depth to upwell (Andrews & Hutchings1980). The majority of the rainfall occurs from May to August,



reaching a peak in June and July with a mean rainfall of above 66 mm, while February tends to be the driest month with a mean rainfall of 5 mm (Schulze, 2009). The mean annual rainfall of between 400 and 500 mm is typical of the West Coast region. Refer to **Figure 4-1**.

The Bokbaai NR is located in the Dassenberg climate corridor. A study on climate adaptations in the Cape Floristic Region (CFR) indicated that this Climate Adaption Corridor had the highest rating in terms of predicted “severity of change” (Pence, 2009). Climate change is expected to pose a significant threat to species in the CFR. The Western Cape is expected to become hotter and drier and experience more intense storms and floods, a higher frequency of fires, and more frequent drought events (Pence, 2009). It is therefore of high importance to conserve the ecological functioning of the Bokbaai NR to the highest degree possible to maximise climate change resilience.



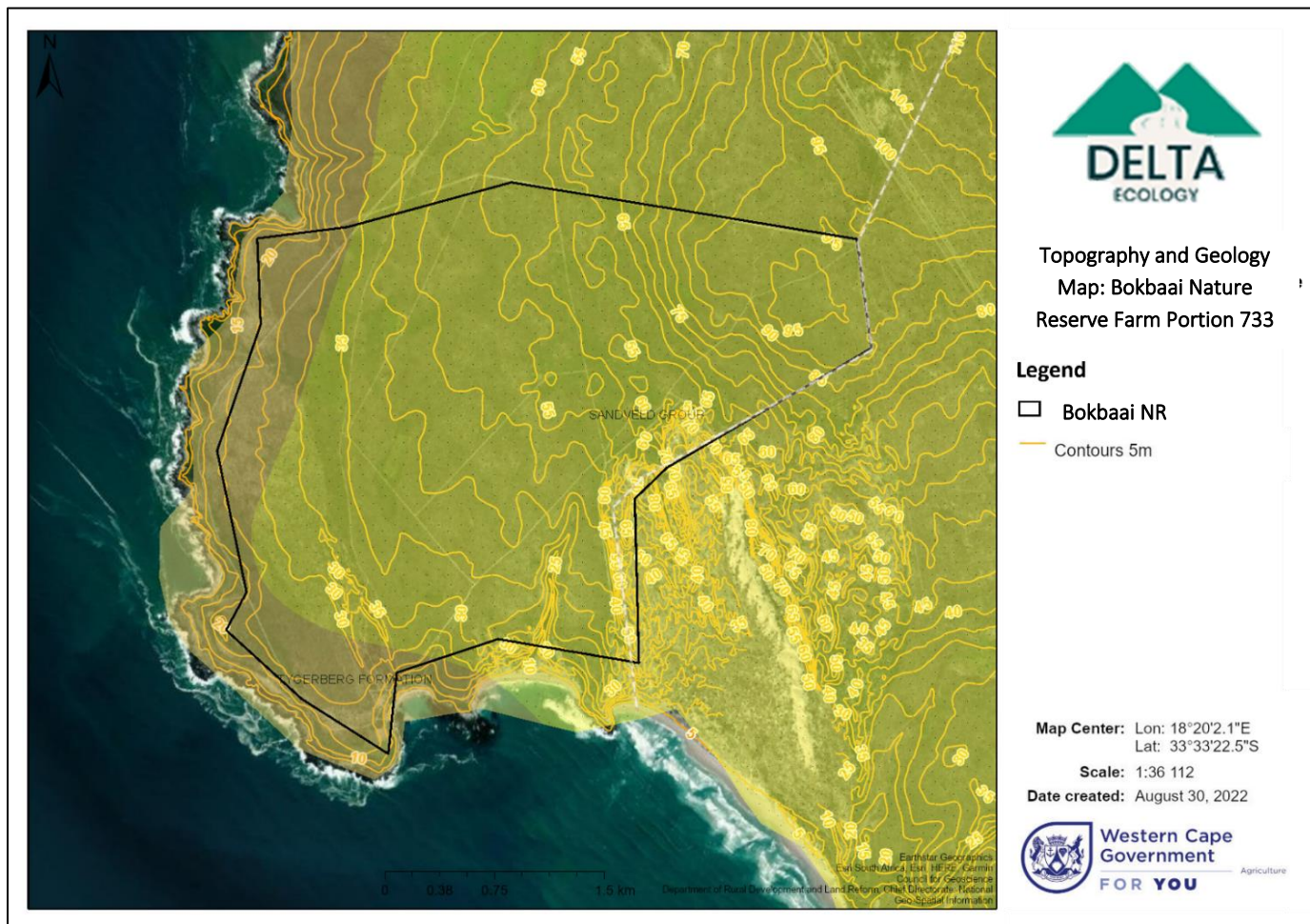
**Figure 4-1: Climate and Weather for Bokbaai Nature Reserve**

#### 4.1.2 Topography, Geology and Hydrology

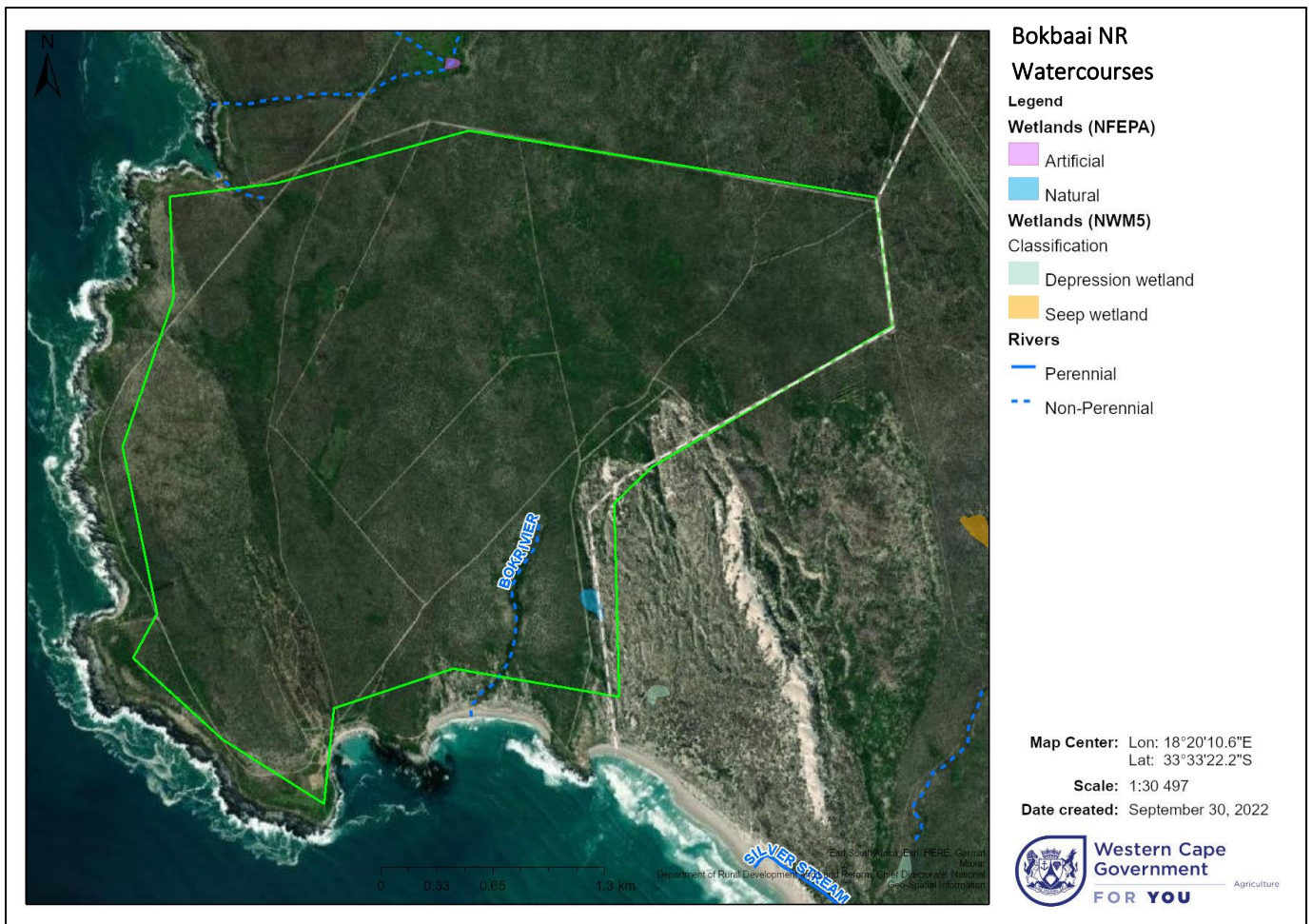
The Bokbaai NR ranges in altitude from sea level to approximately 95 m above mean sea level, with the area gently sloping in an easterly direction. Most of the reserve has a slope of 0 - 3%, while some sections have a slightly steeper slope of 3 - 10%. The dune plumes that occur in the south-eastern part of the property rise to approximately 60 m above mean sea level and are the most prominent topological feature of this landscape, extending south within the Ganzekraal Conservation Area. The soil in the Bokbaai NR consists predominantly of grey regic sands derived from and underlain by quaternary quartz sand of the Springfontein Formation. Limestone and calcrete of the Langebaan Formation occur occasionally in this region, and coastal outcrops of the Malmesbury Group and Quaternary calcareous coastal dune sand of the Witzand Formation may also be present. The soils in the Bokbaai NR are classified as having a high erodibility and are sandy and excessively drained.

The eastern outcrop of the reserve falls within a groundwater strategic water source area, where the coarse sands allow for aquifer recharge. The non-perennial Bok River originates within the reserve and the outflow of this river is located just south of the Bokbaai NR's southern boundary. Several small perched depression wetlands are also present in the reserve and these features, along with the Bok River add substantially to the variety of habitats available within the reserve.

The general topography, geology, and hydrology of the Bokbaai NR can be seen in **Figure 4-2, 4-3 and 4-4.**

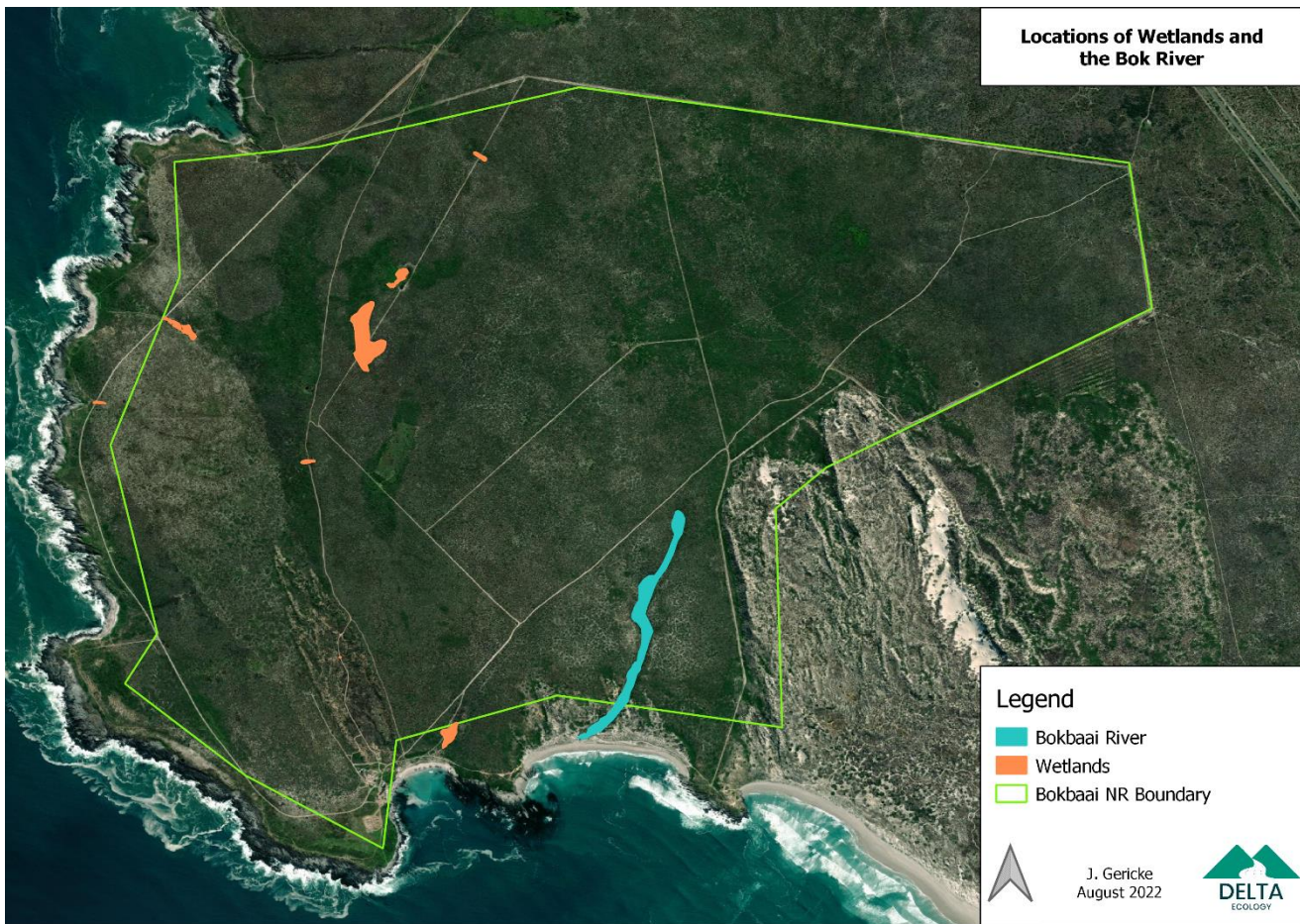


**Figure 4-2: Topography and Geology of Bokbaai Nature Reserve.** The western extreme is underlain by the Tygerberg Formation overlain by marine-derived alkaline sands. The majority of reserve is underlain by the Sandveld Formation overlain by neutral to acidic sands.



**Figure 4-3: Watercourses according to the NGI, NFEPA and NWM5 watercourse layers. Only the Bokrivier, a small portion of an unnamed ephemeral drainage line and one wetland in the southeast of the reserve are indicated.**





**Figure 4-4: Watercourses delineated during the field assessment.**

### 4.1.3 Vegetation

The Bokbaai NR is considered to be part of both the Southwest Fynbos and the West Strandveld Bioregions, within the Fynbos Biome (Mucina & Rutherford, 2006). The reserve is located within the CFR, which is the smallest of six floral kingdoms in the world and is internationally renowned for its species rich flora containing an estimated 9 000 species of vascular plants, of which almost 69% are endemic. Many of the lowland habitats in the CFR are threatened due to agriculture, urbanisation, groundwater abstraction and alien plant encroachments (De Villiers *et al.*, 2016). Many range-restricted rare endemic species are therefore facing imminent threat of extinction, as their habitat is reduced and fragmented (De Villiers *et al.*, 2016).

According to the Vegetation Map of South Africa, Version 2018, there are three primary vegetation types present within the Bokbaai NR (**Figure 4-5**). These are: Atlantis Sand Fynbos, Cape Flats Dune Strandveld and Langebaan Dune Strandveld. A botanical assessment conducted for the reserve by Nick Helme (2017) revealed a modified distribution of these vegetation types when compared to the SANBI (2018) National Vegetation Map (NVM) (**Figure 4-6**). Atlantis Sand Fynbos currently occupies the eastern section of the reserve, with a large proportion of the reserve currently containing a mosaic of Atlantis Sand Fynbos and Dune Strandveld in which pockets of each vegetation type are found (Helme *et al.* 2016). Apart from a wildfire in early 2015 that burnt approximately 140 ha in the western half of the reserve, the vegetation in the Bokbaai NR has not been burnt for at least 30 years (as far as can be ascertained by satellite imagery). As a result, the Atlantis Sand Fynbos, which is fire adapted and generally burns every 10-15 years, is considered senescent and due for a burn. As most of the reserve consists of a mosaic of Fynbos and Strandveld vegetation, a large proportion of the vegetation on this reserve will need to be burnt relatively soon.

Atlantis Sand Fynbos is considered Endangered (EN) and is indicated by the RLE 2022 to occur across most of the reserve. Less than 49% of the original extent of this vegetation type remains and less than 4.6% of it is protected. Bokbaai NR would contribute approximately 1022.44 ha (1.5%) of this vegetation type's original extent. This amounts to approximately 5% of the land area required to reach a conservation target of 30% of its original extent (Rouget *et al.*, 2004). Nick Helm's ground-truthed vegetation map indicates less of this vegetation type, amounting to approximately half the area indicated by the NVM. This vegetation type is species rich containing numerous threatened and endemic plant species and commonly occurs on acidic, moderately undulating to flat sandy plains. Atlantis Sand Fynbos is characterised by dense, moderately tall, ericoid shrubland with periodic emergent, tall sclerophyllous shrubs and an open, short restioid stratum. Restioid and proteoid fynbos species are dominant, while asteraceous fynbos and patches of ericaceous Fynbos occur in seepages (Mucina & Rutherford, 2006).

Cape Flats Dune Strandveld is classified as Endangered with less than 50% of its original total extent remaining, and less than 19% conserved (conservation target = 24%) (Rouget *et al.*, 2004; DEA, 2011). This vegetation type is characterised by flat to slightly undulating (dune field) landscapes covered by tall, evergreen, hard-leaved shrubland with abundant grasses and annual herbs in shrubland gaps (Rebelo *et al.*, 2006). Langebaan Dune Strandveld is considered Endangered with 86% of its original extent is remaining and 52,8% is conserved (conservation target = 24%) (Rouget *et al.*, 2004; DEA, 2011). This vegetation type is characterised by flat to slightly undulating old coastal dune systems with stabilised inland duneveld. This duneveld supports closed, evergreen, sclerophyllous shrubland, up to 2 m tall, while prominent annual herbaceous flora grows in gaps and forms spectacular floral displays, especially after good rain in late winter. The latter two vegetation types are both moderately species rich, containing relatively few threatened and localised plant species.

Strandveld vegetation typically burns once in 20 to 30 years (CapeNature, 2019). It tends to provide higher nutrient availability than fynbos, commonly produces fruits and exhibits grazer/browser adaptations such as thorns. These are indications that, compared to fynbos, the Strandveld vegetation types are adapted to support more substantial concentrations of game animals. The vegetation types are also more prone to thicket dominance in the absence of sufficient browsing, despite frequent fire. The loss of large herbivores from much of the West Coast has further coincided with a decline of at least eight species *Scarabaeus* dung beetles, several of which may be extinct (Harrison *et al.*, 2003). The majority of the dung beetle species' distributions coincide with the presence of strandveld. This decline is another strong indication that large herbivores were once a significant feature of the strandveld vegetation types.

The two strandveld vegetation types that occur in this area have an interesting relationship with the adjacent Atlantis Sand Fynbos. Strandveld and fynbos have a broad, almost imperceptible grading into each other. This relationship is evident in the Bokbaai NR with the majority of the area being made up of a mosaic of Dune Strandveld and Sand Fynbos. From a fire management perspective, this could mean that these areas are adapted to sporadic fire but not at the same frequency as the adjacent Fynbos.



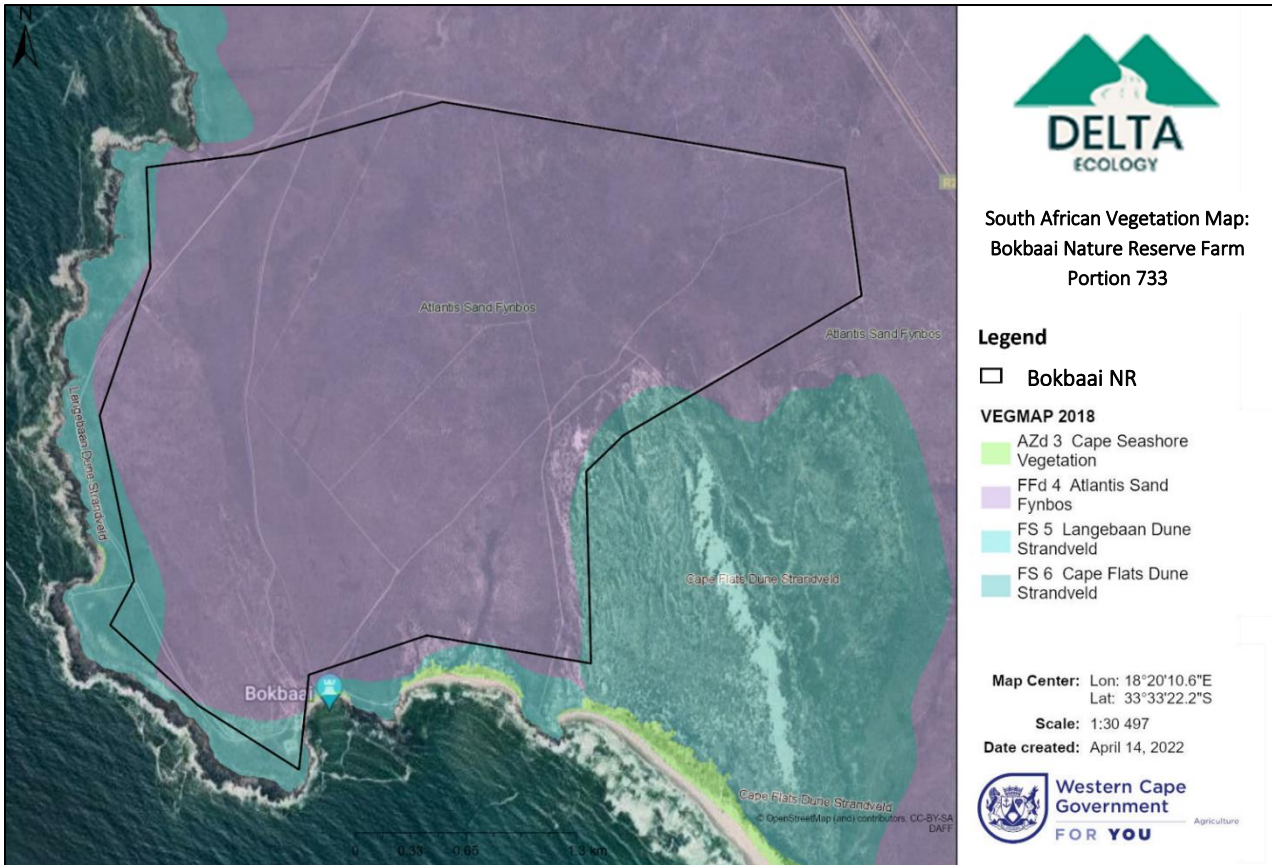


Figure 4-5: Vegetation types found on Bokbaai Nature Reserve.

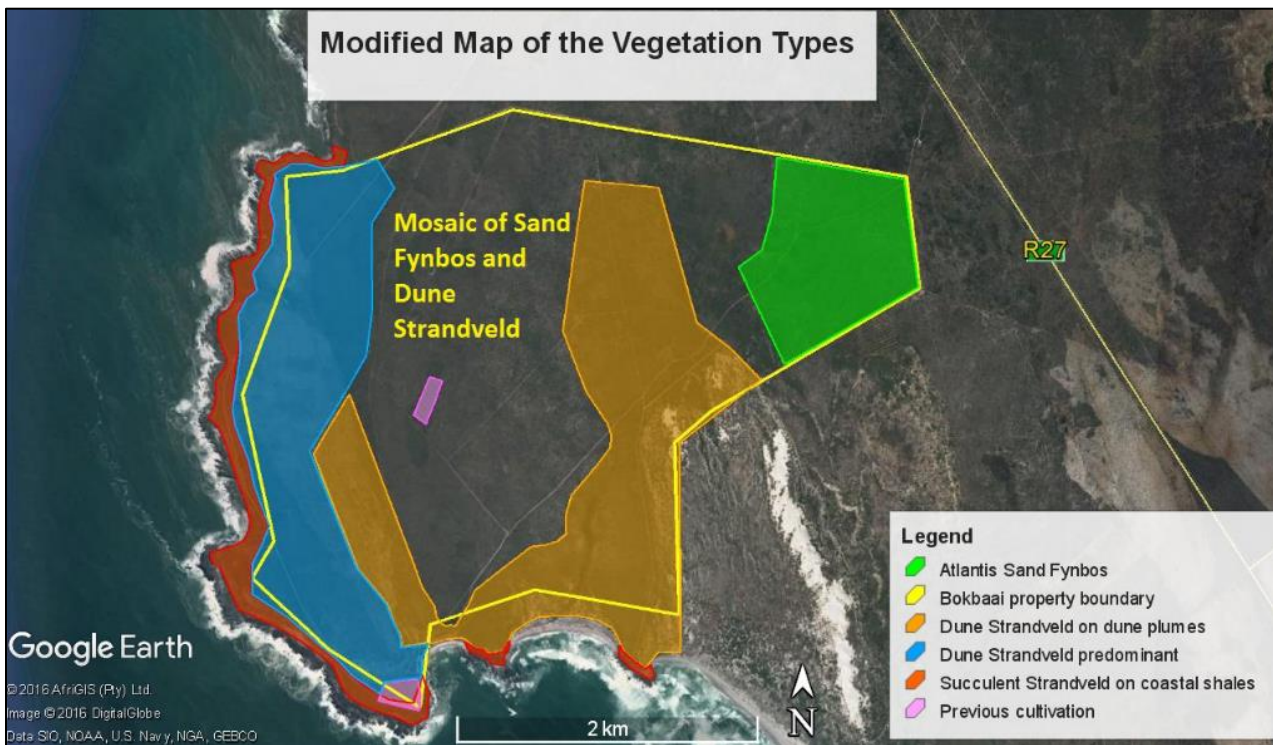


Figure 4-6: Modified map of the main vegetation units on Bokkerivier Farm (Helme, 2017). While the demarcations on the map are not definitive, they give a broad indication of the primary vegetation units.

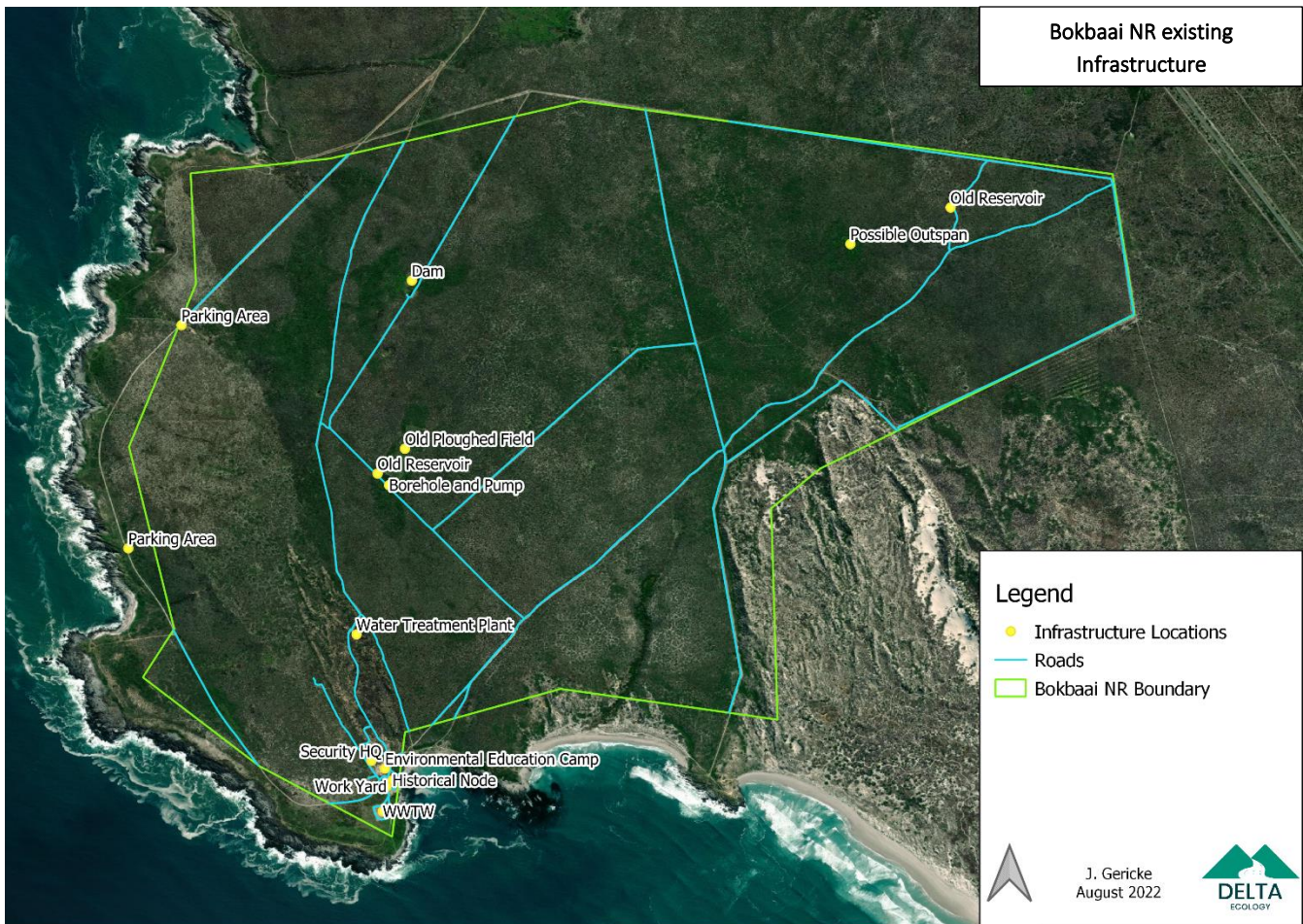
#### 4.1.4 Existing Infrastructure and Disturbed Areas

The Bokbaai NR, like most reserves, is not a blank slate and has a range of existing infrastructure and historical disturbance zones. The infrastructure noted during the field assessment prior to the drafting of this plan included:

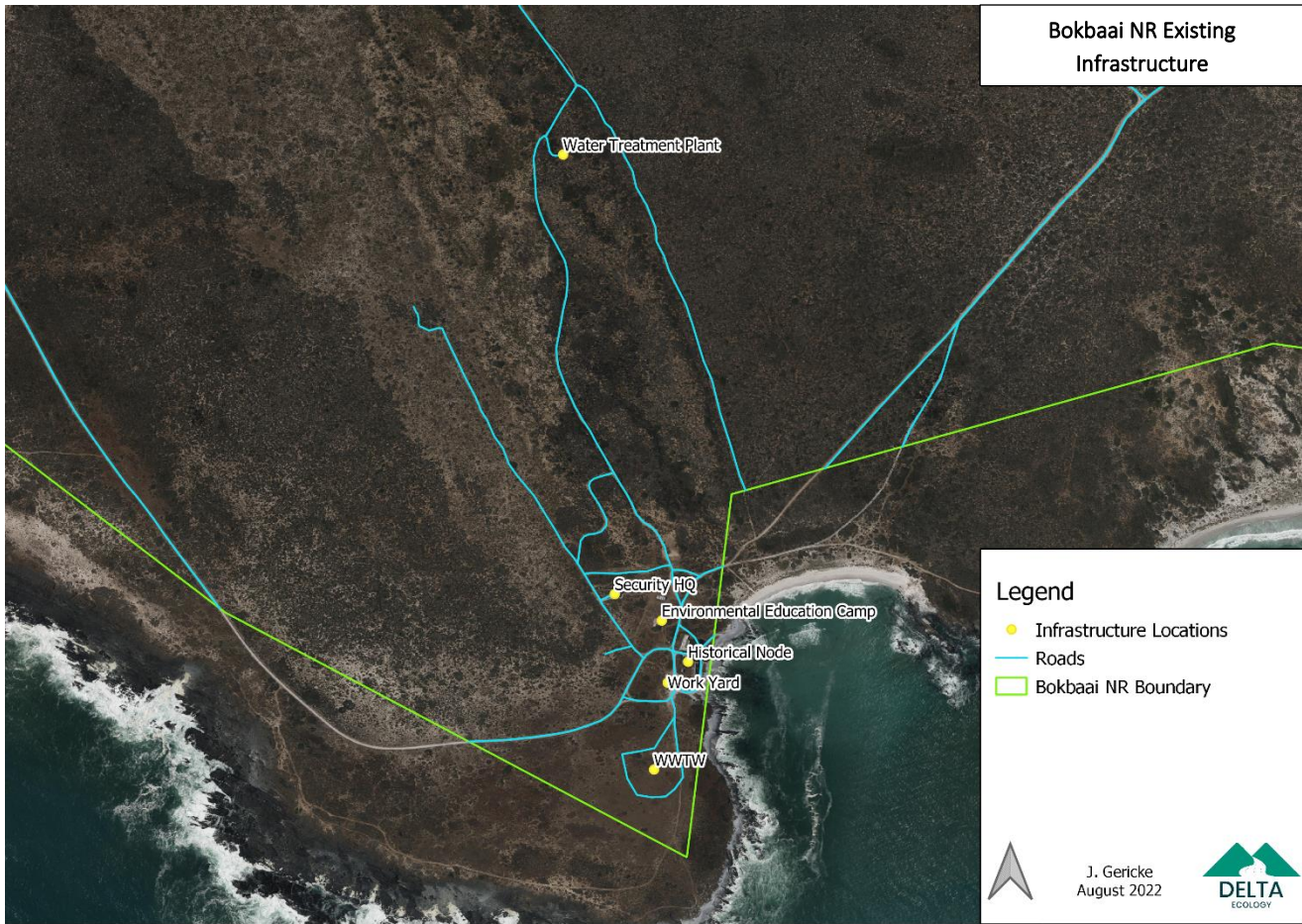
- A perimeter fence;
- Roads and tracks;
- A main infrastructure node containing:
  - Four historical buildings in various stages of restoration and repurposing for use as a museum/environmental education centre, environmental education accommodation units (mainly for camp leaders, etc.) and operational/storage buildings;
  - Boys and girls camp sites separated by a toilet block. The latter is constructed partially underground, covered by soil and locally indigenous vegetation;
  - An old, but not historical, farmhouse which presently serves as headquarters and accommodation for the security staff on site;
  - A waste water treatment works (presently under construction) for treatment of sewage by means of artificial reedbeds. The intention is for liquids to evaporate and solids to be removed periodically by truck;
- A borehole and solar powered pump station;
- A potable water treatment plant;
- The dam;
- A previously ploughed field that has partially revegetated passively;
- Two unused concrete reservoirs;
- Two parking areas (partially outside of the reserve boundary) used by fisherman when accessing the coast;
- A nutrient enriched, grass-dominated area surrounded by a partial screen of *Lycium ferocissimum* which appears to be a historical outspan area.

The locations of these infrastructure and disturbance areas are indicated in **Figure 4-7** and **Figure 4-8** below. Note that the boundary road, fence and outer firebreak are aligned with each other, but deviate markedly from the actual cadastral boundary, sometimes falling within and sometimes outside of the cadastral boundary. The northernmost corner of the fence lies more than 110 m outside of the actual boundary line. Another portion of the fenceline in the southeast corner of the reserve has been shifted up to almost 300 m inside the boundary to avoid crossing a dune field for practical reasons.





**Figure 4-7: Locations of infrastructure and previously disturbed areas across the reserve.**



**Figure 4-8: A closer view of the main infrastructure node.**





**Figure 4-9: Southern Black Korhaan listed as Vulnerable, on top of the newly planted toilet block at the camp site. This is a good indication that the habitat established within the infrastructure node is and will be of value.**

## **4.2 Regional and Local Planning Context**

### **4.2.1 The Protected Area Expansion Strategy and Implementation Plan**

The Protected Area Expansion Strategy and Implementation Plan is a response to the National Protected Area Expansion Strategy (NPAES) (CapeNature, 2015; DEA, 2016) which calls on provinces to develop implementation plans in support of the NPAES and in support of provincial conservation efforts and priorities. The NPAES, which provides a broad national framework for protected area expansion in South Africa, also identifies areas of importance to be targeted for protected area expansion in each province, as well as mechanisms to achieve this. The main priority areas in the Western Cape focus on remaining sites of threatened lowland ecosystems, identified climate change adaptation corridors, and gaps of unprotected natural areas between key reserves. Together these assist in creating a functional protected area network (DEA, 2016). The Bokbaai NR fulfils all these criteria, resulting in a high conservation value.

The draft Western Cape Protected Area Expansion Strategy (WCPAES, CapeNature 2021) addresses the formal declaration of priority natural habitats such as Bokbaai, which was previously only declared a National Heritage Site, as Protected Areas to secure biodiversity and ecosystem services for future generations (CapeNature, 2021).



This strategy is aligned with the concepts and goals of the NPAES and ensures the connectivity of protected areas as well as enabling strategic growth of protected areas. The Bokbaai NR is located adjacent to other strategic properties and forms part of the Dassen Coastal Complex. By forming part of this complex, the Bokbaai NR is contributing to the connectivity of the landscape of intact protected environments and will meaningfully contribute to provincial conservation efforts.

The Dassen Coastal Complex comprises several properties including four provincial nature reserves, a World Wide Fund for Nature – South Africa (WWF-SA) owned property, the state owned Ganzekraal Conservation Area and the privately owned and newly declared Bokbaai NR. This complex is situated on the West Coast of South Africa and supports the largest remaining intact and ecologically viable examples of several threatened lowland ecosystems, making a substantial contribution to national and international biodiversity targets. Furthermore, it provides protection for several threatened plants and animals, including seabirds and marine ecosystems. This complex of protected areas links coastal and inland habitat and acts as a land and climate change refuge for many species. The declaration and management of this cluster of protected areas will offer several benefits to the wider area including climate change resilience, water security, conservation of unique natural and cultural historic heritage, and socio-economic development.

#### **4.2.2 The Strategic Development Framework and Integrated Development Plan**

This refers to the Integrated Development Plans (IDP), Spatial Development Frameworks (SDF) and Land Use Management Systems of the district and local municipalities within which the protected area falls. Bokbaai is located in the West Coast District (WCD) Municipality which covers an area of approximately 31 099 km<sup>2</sup>. The WCD Municipality is made up of 5 Local Municipalities (LM), specifically Matzikama LM, Cederberg LM, Bergrivier LM, Saldanha Bay LM, and Swartland LM. The Bokbaai NR falls within the Swartland LM. The WCD is mostly rural in nature with an extensive agricultural industry and several small towns with limited development, such as Malmesbury, Vredenburg, Saldanha, Moorreesburg, Clanwilliam, Lamberts Bay, and Vredendal. The WCD lies within one of the world's greatest biodiversity hotspots, the Cape Floristic Region (CFR) and includes parts of the Fynbos, Succulent Karoo, and Albany Thicket Biomes.

Since biodiversity is a fundamental component of sustainable development, SDFs and IDPs offer an opportunity to ensure that biodiversity priorities are incorporated into the planning processes. In turn, the identification of biodiversity-related projects for the IDPs can support local economic development and poverty alleviation. The goals and objectives of the Bokbaai NR align well with the objectives of the WCD Municipality and Swartland LM IDPs in terms of protecting environmental integrity, enhancing economic growth, and promoting the social wellbeing of residents.

Given that they are situated in such a unique area, the WCD and local municipalities have a responsibility to aid in the protection of the CFR for present and future generations both locally and internationally, due to its great value. Development decisions should consider the Western Cape Biodiversity Spatial Plan (WCBSP) as well as the local IDPs and SDFs and give particular attention to threatened, biodiverse ecosystems. Developments should especially avoid impacting on Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). CBAs are areas that are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure. CBAs are areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. The main criterion for establishing a nature reserve is that it is located in a majority Critical Biodiverse Area.

**Figure 4-10** shows the range of protected areas recognized in the WCD-SDF as of 2020. The newly declared Bokbaai NR will be included in the updated WCD-SDF and the municipality will plan development accordingly. The Swartland Municipality IDPs and SDFs are updated every five years and must indicate the desired patterns of land-use for the municipality and provide strategic guidance regarding the location and form of development, as well as conservation, within the municipality. The current IDPs were valid until June 2022 and are in the process of being updated. The updated IDPs will include Bokbaai NR as a conservation area.

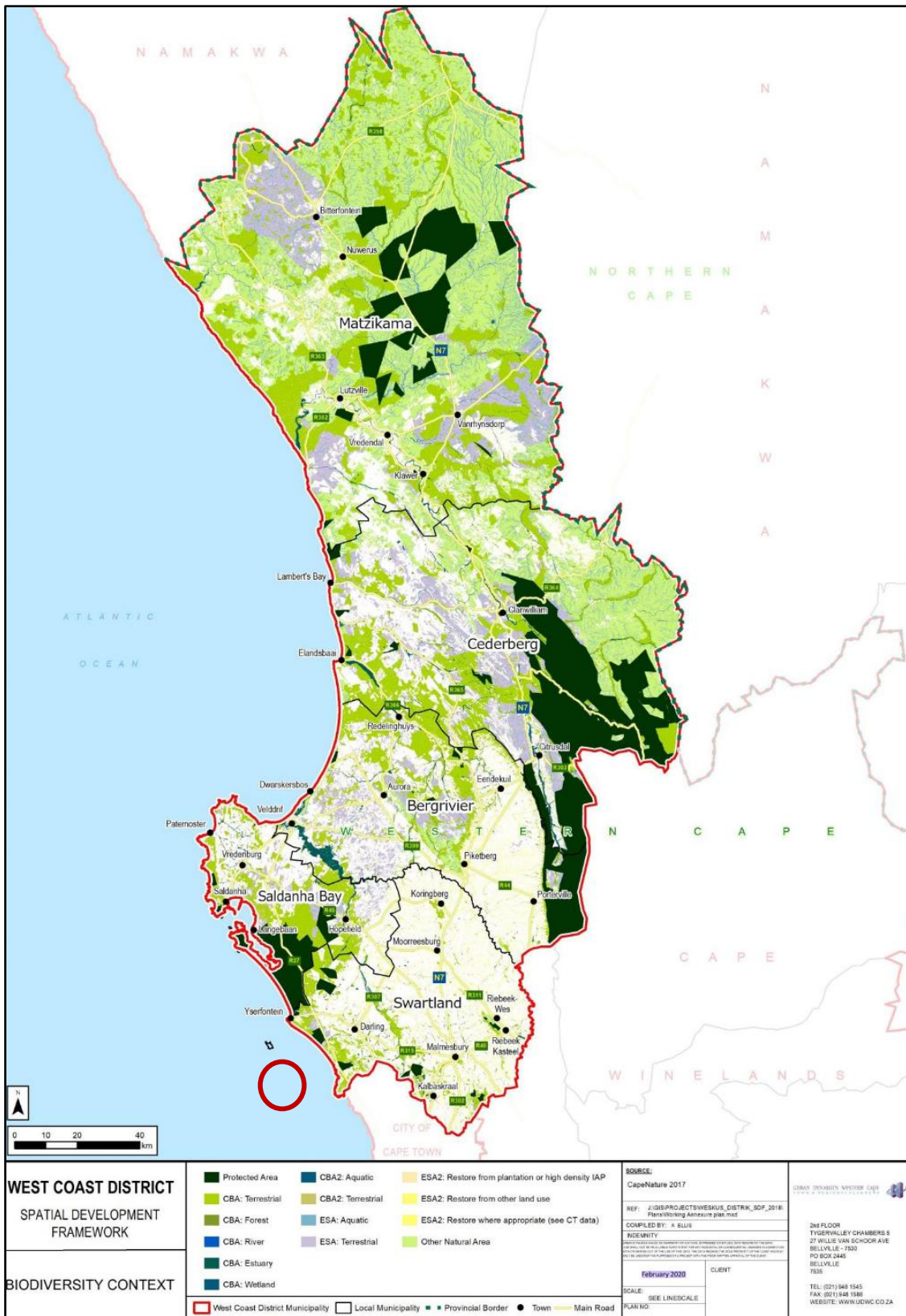


Figure 4-10: Local Spatial Development context for West Coast Municipality (WCD-SDF, 2020)

### 4.3 Socio-economic Context

The Bokbaai NR is situated in the Swartland LM and WCD Municipality in the Western Cape. The WCD Municipality had a population of approximately 455 881 in 2019 and an annual population growth rate of 2.0%. This Category C Municipality is expected to undergo continued population growth over the coming years, both from natural growth and in-migration and is expected to increase by approximately 130 000 people over the next 10 years. In 2018, the district had a total of 118 250 households, 22 190 of which were classified as indigent. The population density in 2019 was 15 people per square km. The Swartland and Saldanha Bay municipal areas had the highest concentration of the WCD's population, with 29.4% and 26.1% of the total population residing in these areas, respectively.

In terms of education, the matric pass rate in 2018 was 82.0% while the learner retention rate was 68.6% and the student-teacher ratio was 31:1 in 2020. The most common dwelling type in this district is brick structures with 79.8% of the population living in a dwelling of this type in 2019, while informal dwellings or shacks was the second most common, housing 10.2% of the population. In 2019, 67.4% of the WCD population was of working age (15 to 64) with an unemployment rate of approximately 10.7%. In the case of the WCD area the GDP contribution per sector in 2017 was as follows:

- Agriculture, forestry & fishing; 20.2%;
- Mining & quarrying; 0,2%;
- Manufacturing; 20.3%;
- Electricity, gas & water; 2.0%;
- Construction; 5.0%;
- Wholesale & retail trade, catering & accommodation; 15.3%;
- Transport, storage & communication; 8.2%;
- Finance, insurance, real estate & business services; 11.4%;
- Community, social & personal services; 6.1%;
- General government; 10.5%.

The Bokbaai NR has a rich history having been used by indigenous tribes for hunting and grazing purposes prior to colonial settlement. The farm is currently owned by the Mapula Trust, and an education centre has been established on site. The Bokbaai NR doesn't border onto any local communities or settlements in this region, and it is thus unlikely that members of local communities use this natural area for subsistence purposes. However, there is a road running through the Bokbaai NR and along the coast just south of the Bokbaai NR's border (but still in the area that will be protected by management activities) that has recently been declared a public road or "Farm Access Servitude". It is well known that this road is used by those who illegally harvest abalone and west coast rock lobster to gain access to the sea front. This could potentially pose a risk to the safety of wildlife within the Bokbaai NR. There is also some potential for land invasion as has been seen in nearby reserves such as the Blouberg Nature Reserve, although the farm is far from major access routes to business centres and services which mitigates this risk to a degree. These socio-economic aspects will have to be monitored long-term and, as far as possible, management actions will need to be put in place to assist in preventing these activities from impacting the reserve negatively.

## 5. Key Features of Conservation Value

The key features of conservation value in the Bokbaai NR are those unique attributes that led to it being identified as a priority for conservation and inclusion in the Protected Areas Expansion Strategy (PAES). These features need to be taken into consideration in management planning as they are the aspects of the reserve that must be prioritised for protection.

The key features of conservation value in the Bokbaai NR are outlined in **Table 5-1**. The Bokbaai NR contains rich biodiversity features, plant and animal Species of Conservation Concern (SCC), unique ecosystems which provide ecosystem services of importance in the area and is designated as a Provincial Heritage Site.

**Table 5-1: Key features of conservation value in the Bokbaai NR (WCPAES – CapeNature 2021)**

Feature of Conservation Value	Description
Biodiversity	Plant and animal Species of Conservation Concern (SCC) including confirmed and possible species. Network of wetlands (including dune-slack wetlands), streams and seeps, some of which feed the Bok River estuary. Dune plumes located in the southeast of the NR.
Unique Ecosystems	Endangered Atlantis Sand Fynbos, Endangered Cape Flats Dune Strandveld and Endangered Langebaan Dune Strandveld.
Ecosystem services	Coastal intertidal (although not within the NR itself, but still in the area that will be influenced by management activities) and inshore systems. Network of wetlands (including dune-slack wetlands), riparian areas and seeps.
Cultural and heritage	The Bokbaai NR is a declared Provincial Heritage Site. The reserve is the location of structures, burial sites, and shell middens known to be older than 60 years (pre-1968).

Each feature highlighted in the PAES is described in further detail in the sections that follow:

### 5.1 Biodiversity

Bokbaai NR is an exceptional property from a biodiversity perspective. The reserve is home to six known plant and animal SCC, but very few surveys have been undertaken and most species records have originated from ad-hoc observation and localised Impact Assessment studies. Additional SCC are likely to be added to the list in the coming years, particularly given the highly threatened nature of vegetation on site. As a case in point, two specimens of *Psoralea cf glaucena* were noted during the rudimentary field visit undertaken by the author in preparation for the drafting of this plan. The specimens may represent an expansion of the known range of the Critically Endangered species or may be a new species of *Psoralea* altogether. The known and potential species lists are provided in **Appendix E**.

### 5.2 Unique Ecosystems



The reserve's threatened vegetation types have been noted in preceding chapters. This is however only part of the overall picture and habitat diversity within each vegetation type is considerable. An array of factors including hydrology, soils, veld age and proximity to the coast have created a patchwork of niche habitats and sub-habitats.

Hillslope seep, depressional and valley-bottom wetlands are dotted across the reserve. The Bok River in the eastern parts of the reserve rises from hillslope seep wetlands and flows southward, providing riparian, seasonal stream and estuarine habitats.

Slope aspect is another significant habitat factor that particularly affects the distribution of many invertebrates. The reserve generally slopes from the north and east toward the coast to the west and south. However, the ground undulates considerably and shallow slopes are present with all slope aspects. The banks of the Bok River Gorge provide steep south and north facing slope aspects.

Vegetation height and composition varies with veld age (since the last fire), but also with changes in soil depth and chemistry, exposure to coastal winds and salt spray and slope aspect. Vegetation forms within the reserve at the time of writing vary from sparse, low dune scrub, all the way to dense thicket that resembles low jungle in places.

It is in this varied mosaic of habitat forms that the full biodiversity potential of each vegetation type is realised. It is extremely important that this habitat mosaic be maintained, and where possible, enhanced.

### **5.3 Ecosystem Services**

The reserve is positioned such that it may provide several ecosystem services. The most significant ecosystem service is the provision of biodiversity, followed closely by the provision of opportunities for immersive nature experiences for environmental education. The reserve is situated close to Cape Town, which makes it a reasonably inexpensive and accessible destination for Cape Town schools for either day trips or short camps. The quality of the habitat and the degree of isolation lend the reserve to fully immersive wilderness experiences that are unparalleled in such close proximity to the Mother City.

### **5.4 Cultural and Heritage**

The history of Bokbaai is bound together with the history of the Cape Colony. The beautifully restored buildings that once belonged to the first governor of the Cape Colony provide insights into the architecture and construction technology of that time period. The buildings, old outspan and the sheltered harbour, surrounded by native vegetation and the view of Table Mountain across the water allows one to visualise and connect with the way of life in the new colony. The old slave gaol is an excellent point of departure for providing an understanding of the plight of the slaves who once dwelt here, of slavery more broadly and of how the Cape Colony and other colonial conquests across the globe affected the indigenous peoples of the conquered lands.

The heritage value of the site is rivalled by few others in the broader Cape Town area. In terms of the immersive nature of the site and the sheer richness of the heritage value on display, it could be counted with the top heritage sites of the Western Cape.

## 6. Management Priorities – Existing Threats and Opportunities

Bokbaai NR, like all nature reserves, is preferentially exposed to certain threats and opportunities. The array of threats and opportunities relevant to reserve management are dictated largely by the history and location of the reserve. It is therefore important to tailor management actions to address the specific array of challenges faced and to make use of the specific opportunities provided by the reserve. During the March 2022 field assessment undertaken to inform the drafting of this management plan, management priority areas were noted and are explained in the sections that follow. Detailed management actions addressing these priority areas, alongside other routine tasks, are included in the operational management guidelines in Section 8.

### 6.1 Alien Invasive Species

The vegetation types within Bokbaai NR can be susceptible to invasions from various species namely, *Acacia saligna*, *Acacia cyclops*, *Eucalyptus*, *Leptospermum laevigatum* and *Briza* species (De Villiers *et al.*, 2016). Alien plant species that are considered high clearance priority for the area are *Acacia saligna*, *Acacia cyclops*, *Acacia mearnsii*, *Eucalyptus* species and *Pinus* species (CapeNature, 2019). The Bokbaai farm and NR management team has done an excellent job of keeping alien invasive vegetation from colonising the reserve. Alien invasive species total cover within the reserve boundaries was estimated at less than a quarter of a hectare (less than 0.025%) during the 2022 site assessment, in contrast with neighbouring CapeNature land which demonstrates substantial alien invasive species cover in the worst affected areas on the boundary with Bokbaai NR.

The only two alien invasive species noted frequently during fieldwork were *Acacia saligna* and *Acacia cyclops*, both woody alien species. The former species was concentrated around the eastern corner of the reserve adjacent to the most severely affected CapeNature land, and isolated individuals were found occasionally across the reserve. The latter species was found mostly in the Bok River gorge, with some also present in the eastern corner of the reserve (**Figure 6-1**).

Seedlings of both species were noted in the reserve in various places, including isolated areas, which highlights their propensity to invade rapidly. While it will not be possible to fully eradicate the two species before this has taken place on the adjacent CapeNature reserves, it is very important that clearing take place at a rate that exceeds the rate of viable seed production such that the population contracts over time rather than increasing. This does appear to have been achieved in recent years, but it should be kept in mind that recruitment of these species is presently limited but will experience vigorous seed germination post fire. It is therefore important to undertake clearing as thoroughly as possible to minimise the volume of seed laid down prior to fire. It is also important to plan for mass clearing of seedlings during the first year or two after both controlled and wildfire.

Several mature *Myoporum tenuifolium* (Manitoka) were found adjacent to the environmental education camping area (**Figure 6-2**). A row of mature *Eucalyptus sp.* was noted at the dam. No seedlings were noted anywhere in the reserve, which indicates that the invasive potential of the species present is severely limited. The Manitoka and *Eucalyptus* are presently used for shade and wind breaks for environmental education activities and may therefore be considered part of the environmental education infrastructure.

Three large *Araucaria heterophylla* (Norfolk pine) are present between the historical buildings at Bokbaai and were originally planted as navigational markers for farmers bringing goods to the boats bound for Table Bay. The trees are non-invasive and form a key part of the heritage value of the site.

Two sites were noted where European honeybees are being kept. The potential impact of these bees is not well defined, although recent research suggests that the impact on native bees, particularly various species of solitary bee, can be substantial.



**Figure 6-1: A view up the Bok River gorge. Note the bright green vegetation is largely *Acacia cyclops*.**





**Figure 6-2: A large Manitoka within the environmental education camp.**

## **6.2 Natural Fire Cycles**

The vegetation types within the Bokbaai NR, particularly Atlantis Sand Fynbos, require fire to function ecologically and to maintain biodiversity. Many species require smoke and/or heat for seed release and/or germination. Lack of fire in these vegetation types leads to thicket encroachment (see **Figure 6-3** below) and a general state of senescence in which many plants stop growing significantly and produce large volumes of dry fuel load (De Villiers *et al.*, 2016). Re-establishing natural fire regimes will be an essential task to preserve and promote biodiversity.

## **6.3 Maintenance of the Veld Mosaic**

Natural succession in both the sand fynbos and strandveld vegetation types, post disturbance, begins with pioneer species including grasses and various *Asteraceae*. This is followed by *Restios*, *Proteas*, *Ericas*, *Metalsias* and other slower-growing and more robust species. In both vegetation types, but particularly in the strandveld, *Sersias* and other thicket species tend to dominate over time, in the absence of disturbance (**Figure 6-3**). Strandveld thicket species are also known to ‘invade’ fynbos areas along common boundaries if not held in check by natural processes. This results in a gradual reduction in vegetation diversity, since the diversity lies largely in the openings between the thickets. Disturbance is however a natural driving force that re-establishes the veld mosaic and maintains diversity.

Wetlands are particularly vulnerable to thicket encroachment. Thicket species grow more readily in terrestrial soils with higher water availability such as along wetland edges. Over time however, the increase in evapotranspiration can desiccate wetland temporary and dryer seasonal zones, allowing the thicket to encroach further. Furthermore *Psoralea cf glaucena* (which has been identified in two of the reserve wetlands during fieldwork in 2022 that informed this management plan) has been observed by the author to be dependent on disturbance and, throughout its range, is absent from wetland thicket patches, existing in grazed or mowed areas only<sup>1</sup>. This phenomenon may be observed in the two wetlands where this *Psoralea* were found where, in both cases, the plants occurred exclusively along the road edge and did not occur deeper into the encroached wetlands.

Fire is an essential driver of both sand fynbos and strandveld vegetation types as indicated in the previous section. Excessively long periods between fires can result in species loss. It also burns back thicket species to a degree and although most adult thicket plants will coppice after fire, seedlings will generally succumb. Reinstating the natural fire regime will therefore be an essential action for preventing thicket encroachment.

However, fire is not wholly effective in combatting thicket encroachment. Many thicket species burn reluctantly and tend to survive fire. After fire, they resprout and rapidly come to occupy the area originally occupied. Fire is therefore a set-back on the path to thicket dominance, but one that is not sufficient to maintain the veld mosaic indefinitely, particularly in the strandveld. Large herbivores may assist as they are an essential part of the natural ecosystem that maintain the veld mosaic and promote biodiversity by browsing, and trampling (Hanekom, 2007; Boshoff *et al.*, 2016). It is highly recommended that appropriate large herbivore species be reintroduced (Radloff *et al.*, 2010; Boshoff *et al.*, 2016).

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<sup>1</sup> Note that this is based on the author's observation and no reference is available. The author managed over 95% of the remaining individual *P. glaucena* plants as part of his protected area management experience at the Zandvlei Estuary Nature Reserve between 2012 and 2017. He has confirmed this observation with several other ecologists and botanists who have been involved in the study, management and conservation of this species.





**Figure 6-3: A uniform wall of thicket in the south-eastern parts of the reserve, in need of disturbance to maintain the veld mosaic.**

## **6.4 Rehabilitation and Infrastructure Rationalisation**

The majority of infrastructure and disturbance sites within the Bokbaai NR relate either to essential infrastructure that is currently in use, historical infrastructure of heritage value, or both. Some infrastructure and disturbance sites are no longer used however and provide opportunities to reduce human impact in the landscape through infrastructure removal and rehabilitation. The following opportunities were noted during fieldwork:

- Rationalisation of road infrastructure and closure of unnecessary roads
- Rehabilitation/landscaping of unused open ground in the main infrastructure node (already underway)
- Rehabilitation of two old parking areas
- Typha control at the dam
- Removal of old concrete reservoirs
- Passive restoration of the historically ploughed field

## 6.5 Climate Change

Climate change can lead to extreme weather events such as increased severity of droughts and storm surges. The droughts in the Western Cape have led to increased reliance on groundwater. Over abstraction of groundwater from the Atlantis Aquifer could deplete the water table leading to rivers and wetlands drying out (CapeNature, 2019). Altering the ecosystem functioning of the landscape.

The most disconcerting issue noted during fieldwork was that all wetlands within the reserve were in a state of slow decline. The outer margins were characterised by dead or dying aquatic vegetation as the various wetland zones have retreated inward over time. Even the dam exhibits dead and dying marginal vegetation around its banks and the edges of the inflowing wetland. It has also become choked with *Typha capensis* due to dropping water levels as indicated above.

The Bok River estuary was also in a less than desirable state, choked with *Typha capensis* with virtually no open water present, despite occupying a similar area. Historical aerial imagery indicates that this change has taken place approximately between 2010 and 2012. By contrast, every photograph prior to 2010 indicates a largely or fully open-water portion of the estuary, whether or not the mouth is open to the sea, despite *T. capensis* being visible in the upper estuary from the late 1990s.

This change was likely caused by a reduction in average salinity over time in the estuary mouth, which would otherwise restrict *T. capensis* to the fresher upper parts of the watercourse. The reduction in saline influence is typically linked to a reduction in mouth opening events which flush fresh water out of the system and allow saltwater intrusion into the estuary, particularly at high tide. The frequency of mouth opening events is related to the relative volume of freshwater input over time. A reduction in freshwater input in an estuary of this type (which only opens to the sea periodically) is therefore paradoxically associated with lower salinities overall.

While the estuary lies seaward of the reserve boundary and therefore outside of the scope of Bokbaai NR management, the majority of the catchment falls within the reserve boundary. Additionally, although it is beyond the scope of Bokbaai NR management to address climate change, it is possible to maximise the resilience of the estuary and the broader Bok River system by removing any factors that may reduce flow or otherwise have a negative impact on the estuary.

The Bok River catchment has already been highlighted as a priority for alien clearing due to the relative prevalence of *Acacia cyclops* and *A. saligna* in the catchment. These trees significantly increase the evapotranspiration rate over the natural vegetation, reducing water availability to the Bok River. They also fix nitrogen in the soil, thereby increasing the nutrient availability in runoff and groundwater that does enter the Bok River. Increased nutrient load in the estuary will allow for *T. capensis* to grow quicker and more densely.

It is unlikely that alien clearing alone will solve the problems at the Bok River estuary, but it will improve climate change resilience to a limited degree. Given the lack of other potential options to address the climate-related issues, this intervention should be treated as high priority.

If there is scope to work outside of the Bokbaai NR, it is recommended that the Bok River Estuary be periodically cleared of *T. capensis* to maintain clear, open water.

Climate change can lead to increased frequency severity of storm surges (Theron and Rossouw, 2008). This can lead to infrastructure loss and damage putting the heritage buildings and other infrastructure on Bokbaai NR at risk. The environmental impacts of storm surges include the alteration of coastlines from erosion or excess sediment build up and freshwater ecosystems being inundated with salt water (Theron and Rossouw, 2008). Which can then lead to altering ecosystem functioning.

## **6.6 Security and Compliance**

The Bokbaai NR has several security issues that need to be addressed. Firstly, the public road into the reserve is regularly used by abalone and west coast rock lobster illegal harvesters who use the coastline around the Bokbaai NR. This issue does not fall directly within the Bokbaai NR mandate as the offences occur outside of the reserve boundary and on the public road. In terms of direct action against the offenders, the role of Bokbaai NR staff should be limited to the provision of information to CapeNature and/or the Department of Agriculture, Forestry and Fisheries, where possible and useful. Furthermore, given the primary use of the reserve for environmental education and the regular presence of school children, the risks associated with a confrontation with organised and potentially violent poachers should be considered excessive and is best left to the authorities.

While direct enforcement is not recommended, structural changes can be put in place that increase the level of difficulty required for illegal harvesting, thereby deterring some of the illegal harvesting effort. Key interventions would include deproclamation of the public road, relocation of CapeNature entrance gate to the common road off the R27, installation of licence plate recognition cameras at the entrance gate and instituting a permitting system (with or without charge) whereby identification is required, along with a stated reason for entry. Formalising the parking areas utilised by the illegal harvesting syndicates and removing access to parking areas out of sight of the main entrance road would also be of value.

Another important aspect to consider in terms of security and compliance is coordination and cooperation with neighbouring landowners. In this case, the Bokbaai NR is surrounded on all sides by Cape Nature reserve land. The Mapula Trust has maintained a good relationship with Cape Nature and both parties are in a position to benefit from opportunities for coordination on security matters. While operations to combat illegal harvesting of abalone and rock lobster should be left to CapeNature and other government authorities, other issues such as theft, land invasion and illegal harvesting of plants or terrestrial animals should be discussed when they arise to determine whether a collaborative approach may be useful.

## **6.7 Environmental and Heritage Education**

Opportunity for environmental and heritage education is listed as a key ecosystem service provided by the reserve. The Mapula Trust, in partnership with the Nature Connect non-profit organisation (NPO), have made excellent strides ahead in this regard. This includes restoration of the historical infrastructure and the repurposing thereof for accommodation, a museum and an environmental education centre. In addition, camp sites, a sewage treatment plant and a toilet block have been constructed. With infrastructure in place, the reserve is in a good position to begin hosting regular school camps and other educational activities.

Opportunities abound to create impactful education experiences for school children. The environmental education programmes should make full use of these opportunities by designing activities that showcase the

reserve's diversity and special features. The heritage value of the reserve should also be incorporated into the programmes.

Environmental education should also not be restricted to school groups. Fishermen also visit the site daily which creates opportunity for meaningful environmental and heritage education by passive means.

## 6.8 Research and Monitoring

The Bokbaai NR has not been well studied to date in terms of the fauna and flora present, and the ecological processes that maintain their habitats. A fair amount of information may be gleaned from research in the surrounding Ganzekraal CapeNature area which has similar vegetation types and management issues. There will be many aspects of Bokbaai NR that are unique, and there is a need to understand the components of the ecosystem and the relationships between them. The research and monitoring priorities for the reserve follow in order of priority:

- Formal confirmation of *Psoralea cf glaucena* identification & population monitoring
- Ad-hoc sightings data collection (formally by trained reserve staff and informally by visitors on iNaturalist)
- Ad-hoc events data collection (e.g. estuary mouth opening/closure events)
- Monitoring of *T. capensis* encroachment in the Bok River estuary
- Watercourse hydrology monitoring
- Bush encroachment monitoring
- SCC plant species surveys
- SCC Invertebrate surveys, particularly *Scarabacae* and *Lepidoptera*
- Verification of the possible historical outspan area identified during 2022 fieldwork
- Small mammal surveys
- Survey Bok River for *Galaxius sp*
- General avifauna surveys
- Herpetofauna surveys
- Alien invasive species monitoring

An additional priority is the creation of a repository where all relevant research papers and monitoring data is kept on hand, which can also be provided to the broader scientific community.

## 6.9 Equipment, Resources and Infrastructure Needs

Discussion with reserve staff indicated that the majority of the tools, infrastructure and resources required for their current duties were available. Several needs were nevertheless noted that will contribute to efficiency and/or will be needed for implementation of new management activities in terms of this management plan. Provision of adequate tools and resources will need to be addressed.

A key equipment need was for an in-field mapping/navigation system. It was noted that reserve staff do not know where the reserve boundary lies and do not have means to record geographical information or navigate to specified locations. Furthermore, the new tasks in the management plan will require field staff to be able to determine the locations of management blocks, SCC plant species and various other elements. This need could be fulfilled by a GPS, but there are many smartphone-based applications that could fill this gap in a superior



manner at little or no cost. This route is therefore advocated, and the selection and provision of smartphone-based mapping software should be a high priority. For biodiversity monitoring the use of camera traps is recommended. This will allow for passive collection of species data.

In terms of infrastructure needs, it was noted during fieldwork that the containers being used for storage were inadequate and that materials and some equipment were stored outside in several locations. There was also no dedicated workshop space for maintenance activities which were also undertaken outdoors. This arrangement detracts from the aesthetics of the main infrastructure node and has reduced the degree to which the large disturbance areas between the buildings can be landscaped/rehabilitated. Provision of an adequate workshop with a storeroom and enclosed work yard is a high priority.

Furthermore, it is possible to further maximise use of the dam for environmental education. Once *T. capensis* is under control, the dam will provide an excellent site for constructing a bird hide. The dam is an excellent location as it is home to black-crowned night herons and other shy waterbirds seldom encountered by school children and which can generate substantial interest in the natural world. It is also a previously disturbed area (particularly nearer the adjacent road) which limits potential impact from construction of the hide.

## 7. Aims, Management Objectives and Key Performance Areas

The objectives that follow give effect to the vision for the Bokbaai NR by clarifying the key components thereof that must be advanced to achieve the vision.

**The aims of Bokbaai NR management are as follows:**

1. To preserve and enhance the ecological integrity of the Bokbaai NR
2. To contribute to the ecological integrity of the Dassen Coastal Complex and Climate Corridor by providing connectivity and continuity, thereby contributing to landscape conservation initiatives that build system resilience;
3. To conserve biodiversity in the protected area;
4. To protect ecosystems, habitats and species (fauna and flora) that naturally occur in the reserve, with particular focus on threatened, rare or endemic ecosystems and species;
5. To preferentially protect the portions of the reserve that are most vulnerable and ecologically sensitive;
6. To ensure and enhance the sustained supply of ecological goods and services provided by the reserve;
7. To manage the interrelationship between natural environmental biodiversity, human settlement and economic development;
8. To preserve the cultural heritage value of the site and to provide opportunity for heritage education and experiences;
9. To expand knowledge of Bokbaai NR ecosystem components, drivers and interrelationships to inform management actions at the reserve and to contribute to the body of conservation information available for the ecosystem types and elements represented at Bokbaai NR;
10. To provide opportunities for research, NGO activities and employment thereby contributing to the local economy;
11. To influence change at all levels of society, internally and externally, through environmental education, awareness and the development of conservation stewards.

Key Performance Areas (KPAs) have been defined to address these aims, which have been further disaggregated into objectives for each KPA and deliverables for each objective. **Tables 7.1-7.4** below set out the KPAs, the objectives for each KPA and the key deliverables for each objective.

In the Annual Plan of Operations (APO), the objectives below are prioritised in terms of importance and urgency and detailed management activities are described that will deliver the desired outcomes under each objective.

**Table 7-1: Biodiversity and ecological components objectives and deliverables**

KPA: Biodiversity and ecological Components		
OBJECTIVE	OBJECTIVE STATEMENT	KEY DELIVERABLES
<b>Biodiversity knowledge management and sharing</b>	To gather, document and share knowledge on how to achieve management objectives with the reserve team to increase management effectiveness, and with the broader conservation community.	<ul style="list-style-type: none"> <li>• Maintain a prioritised list of key knowledge gaps to be researched.</li> <li>• Establish partnerships with academic institutions to close knowledge gaps in a prioritised manner but making use of opportunities as they become available.</li> <li>• Create and maintain an electronic repository for all research conducted at or relevant to Bokbaai NR. Ensure that all researchers working on site provide electronic copies of their reports to the reserve.</li> <li>• Ensure that the management plan is updated in accordance with the latest research during reviews.</li> <li>• Alert the team to any significant research that may change any element of reserve management.</li> </ul>
<b>Research and field surveys</b>	To continually increase the level of understanding of the ecosystems present within Bokbaai NR, such that management of these ecosystems may continually improve.	<ul style="list-style-type: none"> <li>• Establish relationships with key research partners.</li> <li>• Survey and map all SCC plant species as a baseline for monitoring.</li> <li>• Flesh out all species lists.</li> <li>• Ensure that management of Bokbaai NR is in line with latest research and continually improves as new research is conducted.</li> </ul>
<b>Biomonitoring</b>	To provide a quantitative measure of change in the reserve ecosystems over long periods of time such that gradual changes can be managed accordingly.	<ul style="list-style-type: none"> <li>• Establish a protocol for recording ad-hoc sightings of fauna, flora and ecologically relevant events.</li> <li>• Monitor hydrology, vegetation condition, SCC presence and populations by appropriate means.</li> <li>• Ensure that monitoring priorities and protocols are practically implementable by existing field staff with limited additional training, equipment and distraction from present duties.</li> <li>• Capacitate field staff to undertake monitoring tasks by providing required equipment and training.</li> <li>• Ensure that all biomonitoring data generated is stored in a useable, accessible format.</li> <li>• Establish camera trap monitoring for passive data collection.</li> </ul>
<b>Vegetation management</b>	To conserve the fynbos and strandveld mosaics typical of the vegetation types, ensure effective conservation of the floral biodiversity and improve the ecosystem functioning in Bokbaai NR.	<ul style="list-style-type: none"> <li>• Map distributions of plant SCC present on the reserve, with population counts/estimates.</li> <li>• Establish a comprehensive floral species list available for research, management and environmental education.</li> <li>• Delineate boundaries of vegetation types on site at least twice within the pamp lifecycle (every 5 years) to measure any change over time. Alternatively, monitor vegetation type extent over time by appropriate means, e.g. fixed point photography.</li> <li>• Re-establish a near-natural fire regime appropriate for each vegetation type.</li> <li>• Use large game animals to help maintain the veld mosaic.</li> <li>• Undertake active and passive rehabilitation as per the 'restoration and rehabilitation' section below.</li> <li>• Establish an alien invasive flora eradication programme focussed on weedy alien species currently present within the reserve.</li> </ul>

		<ul style="list-style-type: none"> <li>• Ensure that new alien invasive species within the reserve are noted and addressed appropriately as they emerge.</li> <li>• Implement a veld monitoring programme that provides indications of bush encroachment, readiness for fire, presence and density of alien invasive species and change in SCC numbers and, where relevant, distribution.</li> <li>• Ensure that proposed developments and infrastructure are aligned to all relevant legislation including, NEMA, SEMAs and NWA.</li> </ul>
<b>Aquatic and riparian systems</b>	To ensure effective conservation of, improve the biodiversity and ecosystem function of and reduce climate change impact on aquatic and riparian systems within the reserve.	<ul style="list-style-type: none"> <li>• Implement a monitoring programme that provides indications of hydrological supply changes in the aquatic systems of the reserve.</li> <li>• Implement an alien invasive species clearing and maintenance programme for all aquatic systems and their catchments, particularly the Bok River and the wetlands that contain <i>Psoralea cf glaucena</i>.</li> <li>• Survey the Bok River for <i>Galaxias</i> fish species by means of an eDNA sample.</li> </ul>
<b>Wildlife</b>	To ensure effective conservation of faunal species, populations, and inter-relationships to enhance biodiversity and maintain and improve ecosystem functioning.	<ul style="list-style-type: none"> <li>• Reintroduce appropriate large herbivores and manage their populations at viable carrying capacity.</li> <li>• Conduct surveys to determine presence of SCC fauna species in a prioritised manner and establish monitoring programmes to determine continued presence.</li> <li>• Compile and maintain a complete fauna species list covering mammals, amphibians, reptiles, birds and invertebrates, using ad-hoc and survey-related records.</li> <li>• Remove alien European honeybee hives OR establish a research programme to determine impact of the hives on native fauna and flora, including native bees.</li> <li>• Ensure that other potentially invasive fauna species do not become established in the reserve.</li> </ul>
<b>Species of special concern</b>	To ensure populations of species of special concern grow to meet natural population limits, whereafter populations are maintained.	<ul style="list-style-type: none"> <li>• Identify plant and animal species of special concern present on the reserve by formal survey.</li> <li>• Establish and monitor distribution and population numbers of the identified floral species.</li> <li>• Establish and monitor presence of SCC fauna species.</li> <li>• Identify and implement special management requirements for each species if required.</li> </ul>
<b>Illegal harvesting</b>	Endeavour to prevent the illegal harvesting of plants and animals from the reserve.	<ul style="list-style-type: none"> <li>• Maintain security measures currently in place as per Signage, Fencing and Security section below.</li> <li>• Maintain records of illegal harvesting incidents as per the Biomonitoring and Signage, Fencing and Security Sections.</li> <li>• Seek assistance from conservation authorities, law enforcement and SAPS in addressing the illegal harvesting threat at bokbaai NR.</li> </ul>



<b>Rehabilitation and restoration</b>	To ensure that all previously disturbed or transformed areas are rehabilitated, apart from those that are required for essential reserve activities and infrastructure required by this management plan.	<ul style="list-style-type: none"><li>• Remove unnecessary infrastructure and rehabilitate previously disturbed areas wherever possible within the reserve.</li><li>• Use active rehabilitation at the dam by addressing overgrowth of indigenous <i>T. capensis</i>.</li><li>• Implement long term monitoring of restoration/rehabilitation sites to determine effectiveness.</li></ul>
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**Table 7-2 Sustainable utilisation of natural resources objectives and deliverables**

KPA: Sustainable utilisation of Natural Resources		
OBJECTIVE	OBJECTIVE STATEMENT	KEY DELIVERABLES
<b>Environmental education</b>	To provide students with an opportunity to learn about the natural environment and grow in a personal capacity.	<ul style="list-style-type: none"> <li>• Complete construction of environmental education infrastructure as planned.</li> <li>• Maintain relationships with partner organisations such that at least 500 children per year participate in environmental education programmes at the Bokbaai NR.</li> <li>• Provide information on the reserve’s natural features and amenities to environmental educators at partner organisations such that full use is made of the opportunities available in the reserve.</li> <li>• Ensure that environmental education infrastructure, activities and operations do not have a negative impact on any of the conservation objectives of the reserve.</li> <li>• Ensure that environmental education infrastructure design and construction complies with development planning requirements.</li> <li>• Develop trails, bird hides and other appropriate infrastructure to enhance environmental education opportunities.</li> <li>• Erect signage at the main infrastructure node to educate fishermen about Bokbaai NR biodiversity, coastal biodiversity, and conservation.</li> <li>• Ensure that development adheres to all relevant legislation including NEMA, SEMAs and the NWA.</li> </ul>

**Table 7-3 Socio-economic and heritage objectives and deliverables**

KPA: Socio-economic and heritage		
OBJECTIVE	OBJECTIVE STATEMENT	KEY DELIVERABLES
<b>Socio-economic development initiatives</b>	To work with relevant stakeholders to make a meaningful contribution towards the socio-economic development needs of local communities.	<ul style="list-style-type: none"> <li>• Where possible, select employees and service providers from communities near to the reserve.</li> <li>• Contribute to employment within the environmental education NGO sector by providing environmental education opportunities of a quality that will sustainably attract international funding for partner organisations.</li> </ul>
<b>Heritage features</b>	To locate, document, study and conserve archaeological, paleontological, and cultural heritage features on the reserve, while contributing to the body of knowledge on the subject and using the history of	<ul style="list-style-type: none"> <li>• Partner with an academic institution to confirm the possible outspan identified.</li> <li>• Where possible, support academic institutions in furthering the body of knowledge on Bokbaai’s heritage.</li> </ul>

	Bokbaai to educate youth on relevant heritage issues and their links to modern life in South Africa.	<ul style="list-style-type: none"> <li>• Ensure that record of all heritage features are kept on site, including location and all significant information for use in education programmes and research.</li> <li>• Conserve the integrity of all archaeological and heritage features on the reserve through adequate maintenance.</li> </ul>
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**Table 7-4 Management authority effectiveness and sustainability objectives and deliverables**

KPA: Management Authority effectiveness and sustainability		
OBJECTIVE	OBJECTIVE STATEMENT	KEY DELIVERABLES
<b>Legal compliance</b>	To ensure all reserve declaration documentation is in order and ensure that all proposed development within the reserve adheres to all relevant legislation including NEMA, SEMAs and the NWA.	<ul style="list-style-type: none"> <li>• Submit this plan to CapeNature for approval.</li> <li>• Manage the reserve in compliance with the approved management plan.</li> <li>• Train reserve staff on relevant legal obligations and potential pitfalls, and make sure instructions from Mapula Trust on legally complicated actions are clear.</li> <li>• Ensure that no unlawful activities are undertaken by reserve staff or contractors.</li> </ul>
<b>Infrastructure and equipment</b>	To maintain infrastructure and equipment in a sound working condition and to ensure that infrastructure and equipment are adequate to address the needs of field staff in implementing this plan.	<ul style="list-style-type: none"> <li>• Encourage and provide opportunity for reserve staff to raise infrastructure and equipment needs.</li> <li>• Ensure that infrastructure is sufficient for operational requirements in accordance with the reserve objectives.</li> <li>• Ensure that field staff have all equipment and resources required to implement this management plan.</li> <li>• Maintain and service infrastructure and equipment such that it is kept in safe working order.</li> </ul>
<b>Financial management</b>	To ensure that reserve objects are sufficiently funded as far as possible.	<ul style="list-style-type: none"> <li>• Ensure the available annual budget and APO are aligned.</li> <li>• Ensure that annual budgets are spent as planned.</li> <li>• Ensure that the Mapula Trust remains in compliance with all relevant financial legal requirements in terms of South African law, in all transactions and dealings related to Bokbaai NR.</li> </ul>
<b>Signage, access control and security</b>	To ensure that visitors to the reserve conduct themselves in a manner that is consistent with the objectives of this management plan and are assured of safety during their visit.	<ul style="list-style-type: none"> <li>• Ensure the landward perimeter of the reserve is fenced as a clear demarcation of the boundary, and that the fence remains in excellent condition.</li> <li>• Rationalise and maintain signage at the main point of entry alongside the public road notifying entrants that they are entering Bokbaai Nature Reserve and providing rules and regulations in the form of pictograms where possible, but also as text where necessary.</li> </ul>

		<ul style="list-style-type: none"> <li>• Maintain security measures currently in place and ensure that the security measures are reviewed at least once per year and after any security incident to ensure that they remain adequate.</li> <li>• Make a reasonable attempt to de-proclaim the public road such that access to the reserve can be lawfully managed by the reserve.</li> </ul>
<b>Firefighting</b>	To ensure that lives and infrastructure are adequately protected from wildfire, that Mapula Trust is adequately protected from fire-related liability and to ensure that burn frequency does not exceed natural limits.	<ul style="list-style-type: none"> <li>• Maintain membership of the Greater Cederberg Fire Protection Association.</li> <li>• Maintain adequate firebreaks.</li> <li>• Ensure that reserve field staff are adequately equipped and trained to apply reasonable firefighting effort.</li> </ul>



## 8. Operational Management Guidelines

This section provides technical guidelines for addressing the management objectives and deliverables outlined in Section 7 above, thereby informing the Annual Plan of Operation (APO) and the reserve budget. The APO is attached as Appendix D.

### 8.1 Management Units

It is useful for planning purposes to divide protected areas into management units such that large scale management actions including ecological burning and alien clearing can be broken down into manageable portions and prioritised. In the case of Bokbaai NR, the existing road network, reserve boundary and fire breaks provide useful boundaries for defining management blocks. Twelve management blocks have been defined ranging in size from 7 to 232 ha, each with their own characteristics. Most of the management blocks are between 45 and 200 ha (**Figure 8-1**). Smaller management blocks include the main infrastructure node and two coastal areas west of the main access road. The latter coastal blocks exhibit lower-growing coastal vegetation, preferentially impacted by wind and salt spray to an extent that the growth form is distinct from other management blocks. Although small, these blocks likely require unique management measures and have therefore been kept separate. The management blocks for the purposes of this plan are defined on the map below and designated by number.

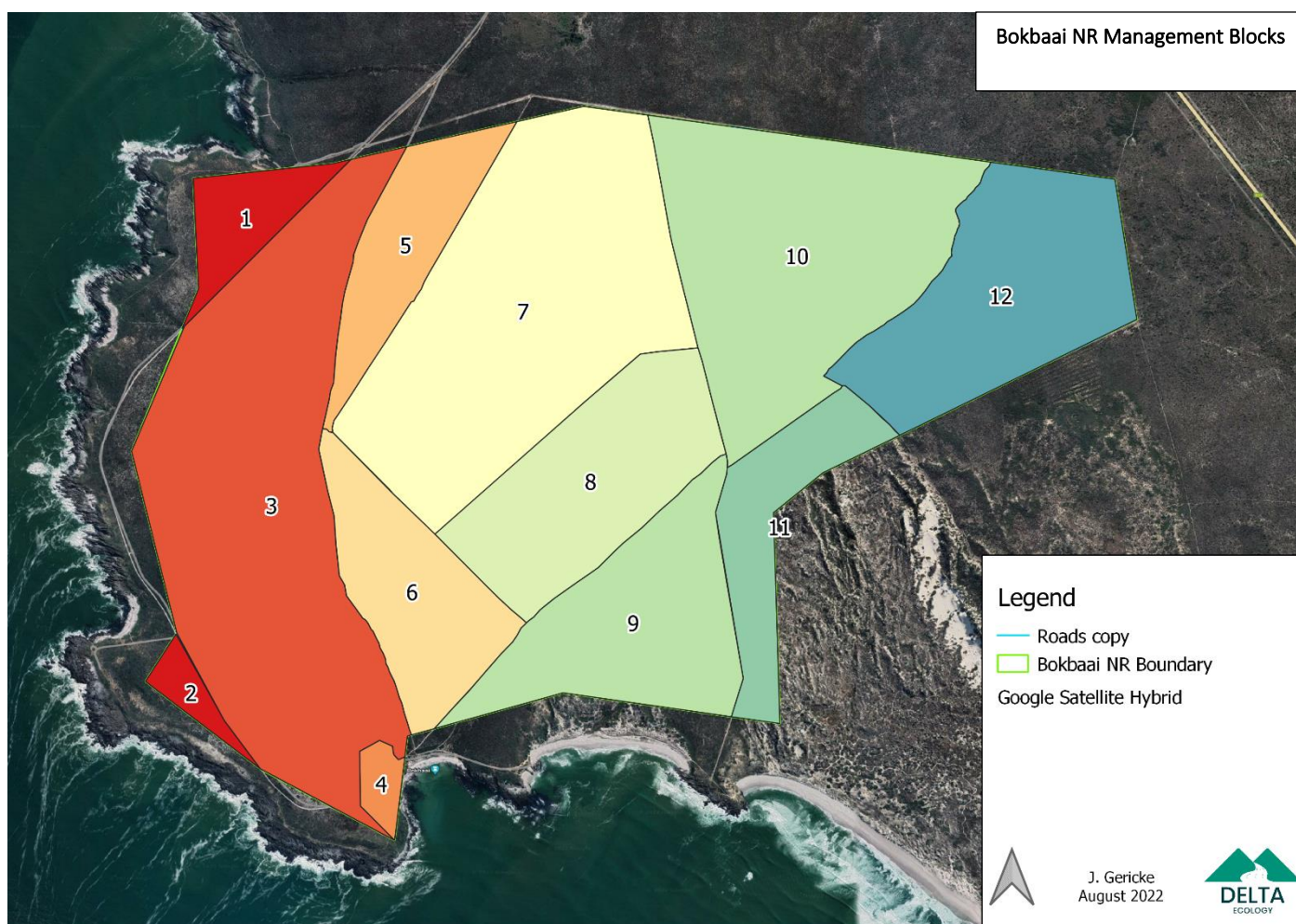


Figure 8-1: Bokbaai NR numbered management blocks.

## 8.2 Biodiversity and Ecological Components

### 8.2.1 Biodiversity Knowledge Management and Sharing

Research, planning and monitoring are of little use if the data and reports produced are not accessible. Making information accessible to reserve staff, environmental educators and the broader scientific/conservation management community does not require a complex system in the case of Bokbaai (Figure 8-2).

Given the volume of research and data expected to be generated in the coming years, complex databases are not required for storage. A basic shareable, cloud-based repository (such as Dropbox or Google Drive) with a simple file structure where papers, data and projects can be categorised by subject, will be adequate to store and share relevant information where needed. Folders should be shared with reserve staff, environmental educators and researchers working on the reserve as required. Alternatively, plans and data may be uploaded to the City of Cape Town's Biodiversity Database site for Bokbaai NR. Refer to the Ad-Hoc Sightings section below. It will be essential to delegate responsibility for maintaining the repository to a single individual.

Sharing information with academics and conservation managers not directly involved with Bokbaai NR should take place in two ways. Firstly, academics working on the reserve should be encouraged to publish where possible, ensuring that research is available on online searchable academic databases. Secondly, a basic website for the reserve indicating, among other things, availability of data, reports/plans and other information with contact details for the responsible person should be created. A possible alternative would be to make information available for download from such a website. Either approach is acceptable and results in information generated on site being available to those who are in a position to use the information for furthering the cause of conservation.

**Table 8-1: Biodiversity Knowledge Management and Sharing Tasks**

Management Activity	Timeframe
Draft and maintain a list of research priorities and make it available to partner institutions.	Year 1 – Ongoing
Establish partnerships with academic institutions to pursue research objectives.	Year 1 – Ongoing
Create and maintain an electronic repository for all research conducted at or relevant to Bokbaai NR. Ensure that all researchers working on site provide electronic copies of their reports to the reserve to add to the online repository.	Year 1 – 3
Ensure that the management plan is updated in accordance with the latest research during reviews.	Year 5
Alert the field staff to any significant research that may change any element of reserve management.	Ongoing

### 8.2.2 Research and Field Surveys

Bokbaai NR has not been well researched or surveyed and there are many fairly basic knowledge gaps to be filled, as listed in Section 6 above. Bokbaai NR lacks in-house capacity for research, but the reserve is conveniently located near to Cape Town and there are many local academic institutions to partner with. The required surveys, including for addressing each of the present priorities, follow.

#### 8.2.2.1 SCC Species

At least six threatened species have been recorded at the reserve. These include:

### Plants

- *Babiana nana* (EN)
- *Leucospermum hydrophyllocarpodendron* (EN) – Grey-snakeskin pincushion (subspecies to be confirmed)
- *Psoralea cf glaucena* (CR) – Muizenberg fountainbush (species to be confirmed)

### Invertebrates

- *Aloeides thyra* (EN) – Red copper butterfly

### Birds

- *Afrotis afra* (VU) – Southern black korhaan
- *Circus maurus* (EN) – Black harrier

Of these, *Leucospermum hydrophyllocarpodendron* and *Afrotis afra* were confirmed to be present and relatively common during fieldwork, and appropriate habitat for the other previously recorded species was confirmed. It is likely however that other SCC species are present but remain undetected. Lists of possible SCC species are attached in **Appendix E**. Comprehensive surveys by partner organisations are essential to ensure that all SCC species are accounted for and can be monitored and managed. The following surveys should be undertaken, in order of priority as far as possible, to complete the list of SCC species. These surveys will furthermore confirm the presence of the other previously recorded species and will flesh out the species lists with non-SCC species.

SCC surveys will require academic assistance. Survey methodologies vary from group to group and from taxon to taxon and may be complex. The following prioritised research/survey list should be provided to academic partner organisations such as CREW (plants), Iepsoc (butterflies), the University of Cape Town, and conservation departments at the University of the Western Cape, Stellenbosch University and the Cape Peninsula University of Technology. It is likely that all listed surveys and projects could be completed adequately within the five years by students under supervision.

### *Psoralea cf glaucena*

This species, thought to be *Psoralea glaucena* (CR), but which may be an entirely new species, is the highest priority in terms of research (**Figure 8-3**). It is therefore addressed separately from the other SCC plant species.

1. Collect a sample during spring (flowering season) and confirm whether the species is *P. glaucena*. Use the following procedure:
  - a. Fill a small bottle with water and take to the sampling site.
  - b. Take several general photographs of the stems, leaves, flowers and overall growth form.
  - c. Select a stem with two flowers or two stems with one flower each.
  - d. Neatly trim the stem/stems using secateurs or a large pair of scissors.
  - e. Place the stem/stems in the bottle to keep the sample fresh.
  - f. Transport the sample immediately to a SANBI taxonomist at the Compton Herbarium at the Kirstenbosch Botanical Gardens ([Compton.Herbarium@sanbi.org.za](mailto:Compton.Herbarium@sanbi.org.za)) for identification and provide photographs for additional information. A photograph of one of the plants is provided below, along with a map of indicating the two locations, for reference when sampling (**Figure 8-4**). If the species is confirmed to be a new or threatened species, implement task 2 below.



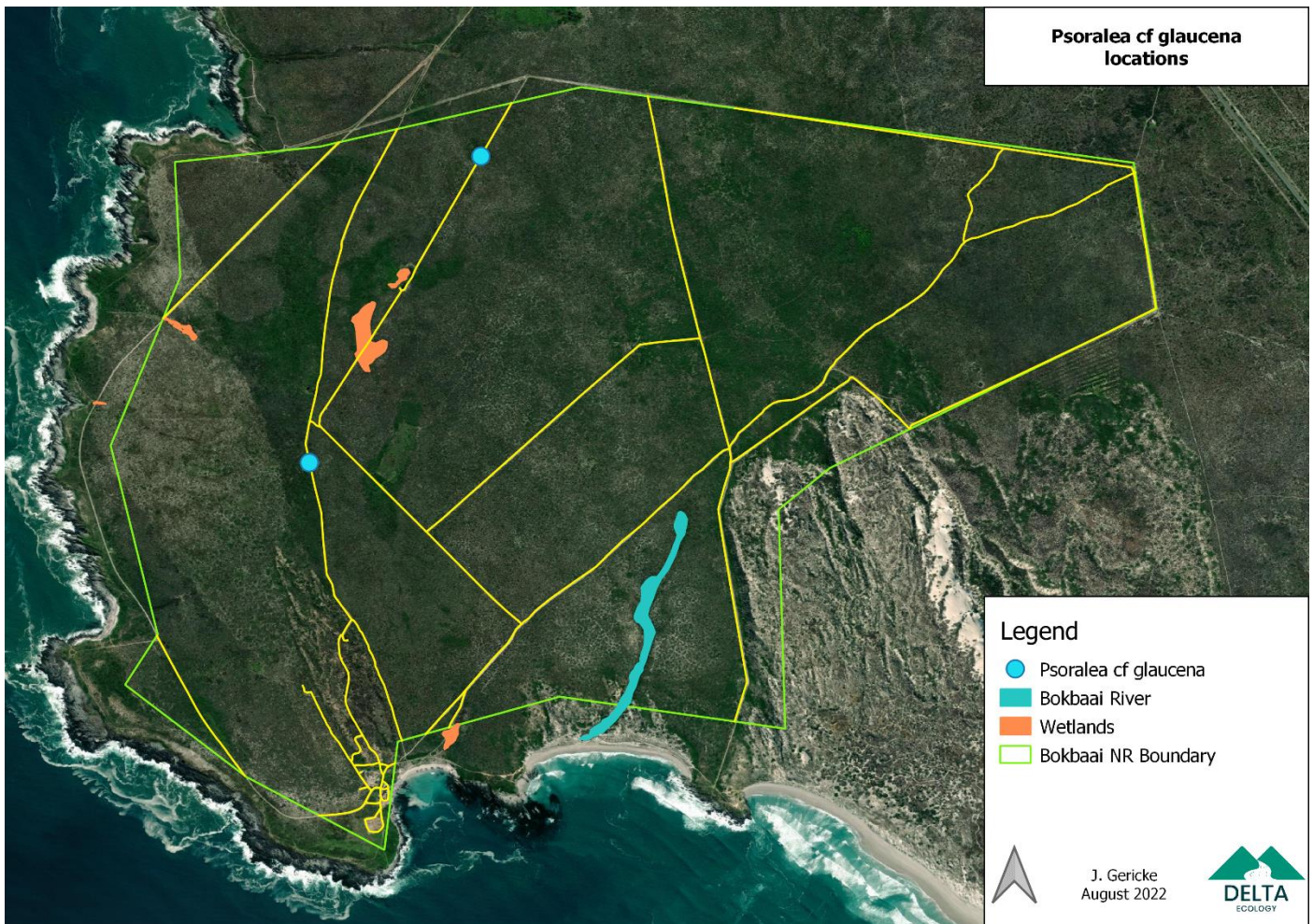
2. Undertake a botanical survey of all wetlands on the reserve to determine whether any additional populations exist. Surveys may take the form of a simple search. All additional locations should be marked by GPS (a smartphone may be sufficient) either using a point (for small areas) or by walking the outer boundary of larger patches, if located.

Sampling and surveys of the other wetlands to locate any additional populations should ideally be conducted by a botanist or vegetation ecologist but could be undertaken by reserve staff who have familiarised themselves with the species and the sampling protocol. Alternatively, SANBI, Bolus Herbarium staff at the University of Cape Town ([Timm.Hoffman@uct.ac.za](mailto:Timm.Hoffman@uct.ac.za)) or the Custodians of Rare and Endangered Wildflowers (CREW) would most likely be willing to assist.



**Figure 8-2: A photograph of *Psoralea cf. glaucena* in one of the two wetland patches, growing through the *Cynodon dactylon* (kweek grass) on the road verge.**





**Figure 8-3: Map indicating the two very small wetlands where *Psoralea cf glaucena* was recorded.**

### ***Baseline SCC plant surveys***

While some preliminary plant surveys and ad-hoc records have provided some information on the plant species of the reserve, knowledge of the reserve flora is far from complete. Having the CoCT biodiversity branch assist with biodiversity monitoring would be beneficial. SCC surveys as indicated below would generate sufficient information to effectively manage the SCC species present on site. Key tasks include:

- General “bioblitz” type surveys to determine whether any additional SCC species are present. These will need to be undertaken during all four seasons at least once per season.
- Mapping of known SCC plant species to determine distribution and, where the population is less than 30 individuals or patches, the location of each individual or patch.

### ***Baseline SCC Invertebrate Research***

The only data that is presently available on invertebrates within the Bokbaai NR are a few ad-hoc *Lepidoptera* records. Nonetheless, one endangered butterfly species has been recorded. It is likely given the location, vegetation condition, limited distribution of many invertebrate species and the presence of one SCC species that others will be found in more comprehensive surveys. The following projects are essential to inform management.

- Baseline *Lepidoptera* survey by sweep netting.
- Baseline *Scrabacae* survey by pitfall trap and active capture.

- Other invertebrate surveys recommended by an entomologist.
- Provision of management recommendations for any SCC species confirmed.

### **Baseline SCC Mammal Surveys**

At present, only ad-hoc sighting information is available for mammals. No formal surveys have been conducted. The following surveys are recommended.

- Small mammal survey by Sherman trap array – ideally using 40 traps over a period of 8 days with appropriate baits.
- Camera trap survey for predators and other medium or large mammal species, using at least 10 camera traps over a period of at least one year.
- Provision of management recommendations for any SCC species confirmed.

### **Bok River Fish Survey**

*Galaxias zebratus* is widespread in the Western Cape but is in the process of being divided into a ‘species complex’. The Silverstroom river at Silverstroomstrand a few kilometres south of the Bok River known to house *Galaxias cf zebratus* which may be a new species or subspecies within the species complex. It is likely that the same, or an additional species may be present in the Bok River which provides suitable habitat for the genus. It is recommended that the eDNA method be used. This method involves analysis of sloughed DNA from species present in the system to generate a species list. Sample analysis is moderately costly but can replace lengthy and even more costly field surveys while providing more comprehensive results. A single sample near the mouth of the river would be sufficient to produce a species list for the river and determine whether any *Galaxias* species are present and if so which species these are. It is also the only method that can be practically attempted presently, given that the open-water portions of the river are choked with vegetation.

### **Seasonal Avifaunal Surveys**

At present, available avifaunal data is limited to ad-hoc sightings. It is worthwhile confirming the presence and degree of dependence of SCC birds on the reserve and fleshing out the avifaunal species list more generally as a by-product. Recommended surveys include:

- Confirmation of whether Black Harrier are present, whether they breed on the site and if so, the location of ground nesting sites.
- General bird surveys in all four seasons to determine presence of additional SCCs and flesh out the general species list.
- Provision of management recommendations for any SCC species confirmed, including Black Harrier and Black Khorhaan.
- Southern African Bird Atlas Project (SABAP) to map the distribution and relative abundance of birds in southern Africa. Western Cape bird clubs can assist with this.

### **Herpetofauna Surveys**

No amphibian SCC species are thought to be present at the site, although four SCC reptiles have been identified that are quite likely present. No amphibian-specific surveys need to be undertaken, but amphibians caught as by-catch during reptile, small mammal and invertebrate surveys should be recorded. Note that these surveys are less

important than other surveys as reptile populations will respond well to good veld management and are unlikely to require specific management measures. Reptiles should be sampled as follows.

- Undertake *Scelotes* survey by active searching in leaf litter and mole hills. At least two full days searching effort by an experienced specialist should be included.
- Undertake a baseline reptile survey involving trap arrays in a variety of habitats. Ideally 15 trap arrays consisting of pitfalls, funnel traps and drift fences should be employed over a period of two to four days, in the summer when reptiles are most active.
- Management recommendations should be made where relevant.

### 8.2.2.2 Research and Survey Tasks

**Table 8-2: Research and Field Survey Tasks**

Management Activity	Timeframe
Send a specimen of <i>Psoralea cf glaucena</i> to SANBI for formal identification.	Year 1
Survey wetlands to determine baseline distribution and population of <i>Psoralea cf glaucena</i> .	Year 1-2
Arrange a “bioblitz” survey with CREW to determine presence SCC species and improve general species list.	Year 1-2
Arrange baseline <i>Lepidoptera</i> survey by sweep netting during early summer (October/November).	Year 2-4
Arrange baseline <i>Scarabacae</i> survey by pitfall trap and active capture.	Year 2-4
Arrange baseline potential SCC-focussed small mammal survey by Sherman trap array.	Year 3-5
Arrange baseline mammal SCC-focussed camera trap survey.	Year 4-8
Arrange Bok River fish survey by eDNA	Year 3-6
Arrange avifaunal baseline surveys in four seasons	Year 4-8
Arrange <i>Scelotes</i> active search survey	Year 3-6
Arrange herpetofaunal baseline survey by trap arrays	Year 4-7

### 8.2.3 Biomonitoring

Most ecological changes tend to take place over long periods of time. It is therefore difficult to notice or provide evidence of either degradation or improvement over time without a robust, long term monitoring programme in place. At the Bokbaai NR, monitoring capacity is limited in terms of staff time and scientific training. It is therefore important that any vegetation monitoring that take place be simple and of low cost but must produce data that can be analysed or interpreted by subject matter experts at a later date to advise on management. The biomonitoring programmes that follow should be implemented.

#### 8.2.3.1 Ad-Hoc Sighting and Events Records

Ad hoc sighting records are unlikely to provide useful information over a short period of time. Over years or decades however, ad hoc sighting records can become a robust, statistically significant datasets. It is therefore important that a platform be available to reserve staff to record such sightings.

The City of Cape Town’s Biodiversity Database ([www.biodiversity.co.za](http://www.biodiversity.co.za)) is an online database designed for this purpose. Although initiated by the City’s Biodiversity Branch, the database is not limited to the City and a Bokbaai NR site already exists. Reserve staff and environmental educators should be granted access to the database for the purpose of adding ad-hoc sightings.

The usefulness of the data accumulated over time depends greatly on the capacity of the people logging the sightings to correctly identify the species at hand. Ideally, all staff that are provided access to the database should take part in the City's Observer Standards training programme. Alternatively, field guides should be made available to staff to learn at their own pace in the course of their duties, with all sightings vetted by an appropriately trained observer.

The database calendar is also designed to log other events observations. Documents describing the event may be uploaded, along with maps or geographical data files. All events that could potentially be of relevance to reserve ecology should be recorded here. This includes, but is not limited to:

- Wildfires and ecological burns.
- Estuary mouth opening and closing events.
- Illegal harvesting, fence theft and other security-related incidents.
- Species reintroductions.

For the general public to contribute to ad-hoc sighting the use of the iNaturalist app is recommended as it is easily accessible and user friendly.

### 8.2.3.2 Hydrology

Given the apparent drying of the watercourses within Bokbaai NR, it is essential to monitor local hydrological changes to inform the need for management actions such as relocation of SCC plant species. Hydrology should be monitored by means of the following two methods.

- Install a basic rain gauge at staff accommodation and record rainfall weekly in a logbook to be entered into a spreadsheet once per annum and uploaded to the data repository.
- Construct and install a water level measuring rod in the dam marked at 10cm intervals. Take a reading once per month and record it in a logbook. Enter the readings once per annum into a spreadsheet and upload to the data repository.
- Delineate all watercourses once in ten years in accordance with the DWAF (2008) standard methodology to determine whether the watercourse extents have changed. Upload GIS files (.shp, .kmz or similar), individual extent maps (for each wetland) for the year of study, overlay maps using the 2022 extent as a baseline, and an spreadsheet containing wetland areas for each wetland in each year of study.

### 8.2.3.3 Vegetation Condition

While it would be ideal to install vegetation monitoring plots or transects with regular botanical surveys at key locations across the reserve, it is not presently feasible due to manpower, budgetary and capacity constraints. While the data generated by such detailed monitoring would be of scientific relevance, there is little to be gained from this approach for management purposes over simpler monitoring methodologies. The following simpler methodologies should be employed.



## Fixed-point Photography

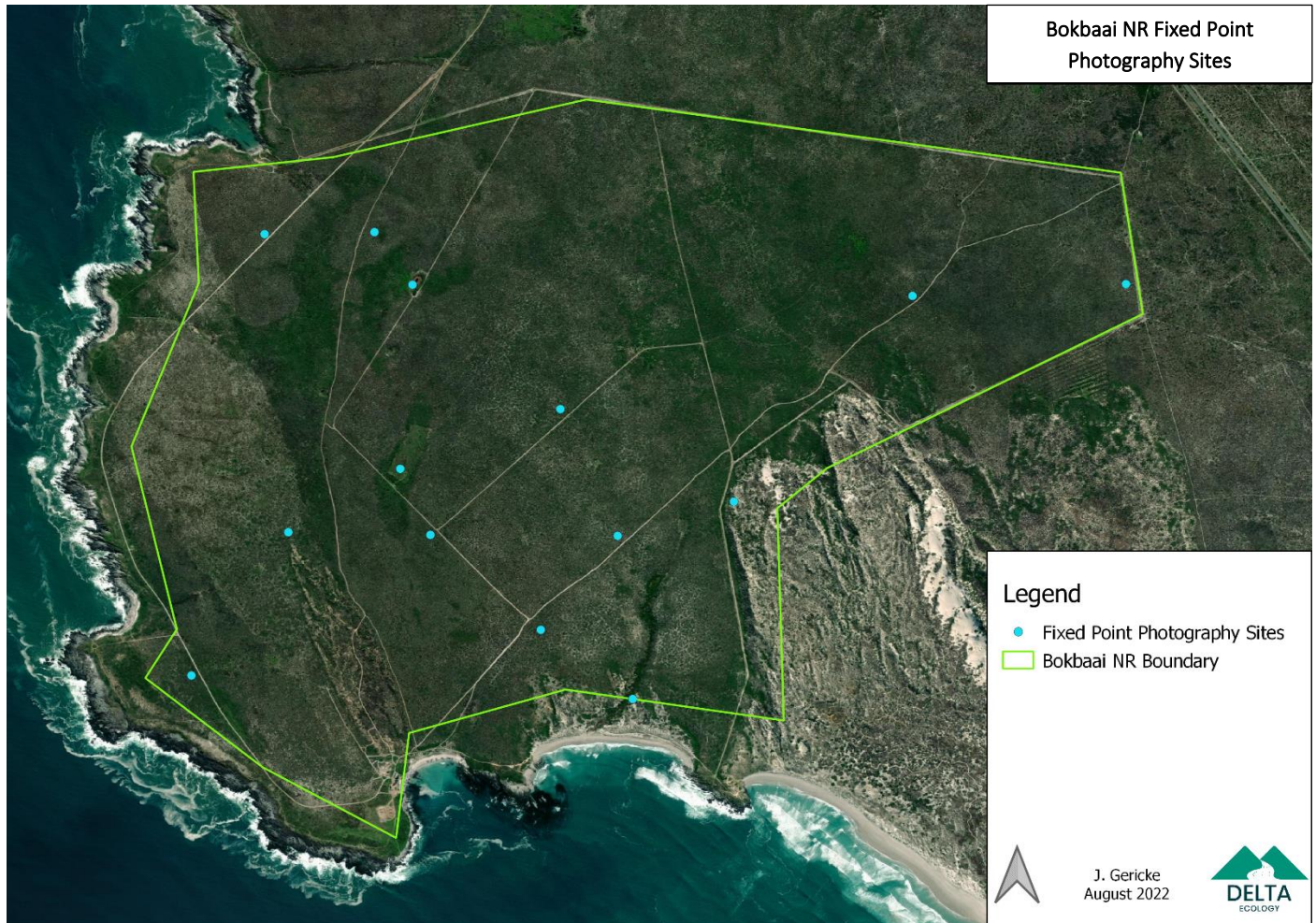
Repeat photography is a common and highly effective mechanism for monitoring not only species composition, but also vegetation height, structure and signs of disturbance and senescence. It allows for a rapid appraisal by an expert of fire readiness, thicket encroachment and the appropriateness of game stocking rates which is the primary purpose of vegetation monitoring at Bokbaai NR. The photographs can furthermore be analysed formally to provide more detailed information at a later stage if needed. Furthermore, once set up and properly equipped, the reserve can conduct a fixed-point photography survey once per year in a few hours with no specialist equipment or advice required.

One fixed point photography site has been designated within each management block to monitor general changes in the vegetation. Additional photographs have been designated at key rehabilitation/management areas such as the old, ploughed field, the Bok River Estuary (primarily to monitor *T. capensis* encroachment) and the dam, bringing the total to 14 sites. Refer to **Figure 8-4**. Set up each site and the required equipment as follows:

- Purchase the following materials:
  - Concrete (approximately 0.064 m<sup>2</sup>/site)
  - Galvanised, stainless steel or aluminium square tubing – approximately 50 x 50 x 600 mm – one per site
  - Two wooden batons (approx. 44 x 44 mm) at 1.6 and 2 m long
  - Black and fluorescent orange spray paint
  - A roll of masking tape
  - A stencil with large numbers plus a stencil with a 20 mm long arrow or triangle shape (either purchased or made from plastic/cardboard sheeting)
  - ‘Hammerite’ or similar anti-rust paint (if galvanised steel is used) – colour of choice
  - A basic digital camera with a 35 mm lens or equivalent
  - A compass
- Cut the square tubing into 600 mm sections. If galvanised steel tubing is used, coat the tube liberally in anti-rust paint.
- Cut the two batons to length as indicated. Tape off 10 cm sections from one end of the baton. Paint the 2.5 m long baton black spray paint. Allow paint to dry fully. Remove the tape from previously taped sections and cover the painted sections with tape. Paint the pole with fluorescent orange spray paint. Allow to dry fully. Remove the tape. Stencil a ‘0.5’ onto the middle of the orange section nearest to 0.5 m from the ground. Stencil an arrow/triangle shape above or below the numbering, with the point indicating where the 0.5 m mark lies. Do the same for 1 m and 1.5 m. Allow to dry fully before use.
- At each site, dig a hole by hand of approximately 400 mm square. Insert the 600 mm long tube into the concrete such that only 200 mm protrudes directly upwards. Mix and pour concrete into the hole such that the concrete base lies just 10 cm below the surface. Cover the concrete base with sand while wet for aesthetic purposes.
- Once the concrete is dry, chose a sunny day that is not overly windy and visit the fixed-point photography sites. Two people are required for the task. Take photos in accordance with the following procedure:
  - Person 1: Take the long, spray-painted pole. Pace out 10 m on a direct northerly compass bearing (magnetic north) from the concrete base. Hold the pole vertically at the point paced out. Be sure that the numbering faces the camera.

- Person 2: Place the pole in the square tube that protrudes vertically from the concrete base. Place the camera on top of the pole and take the photograph.
- Repeat such that photographs are taken facing north, south, east and west at each site.

Fixed point photography should be undertaken once per season (all four seasons) during the first year and every third year thereafter.



**Figure 8-4: Locations for fixed point photography sites.**

#### *Indicator Bird Species*

Thicket encroachment monitoring by fixed point photograph as indicated above is somewhat subjective. Having a secondary measure of encroachment, linked to actual ecosystem changes caused by thicket encroachment, would be ideal. Several bird species are sensitive to habitat structure and their departure can indicate excessive thicket. It is recommended that the following two species (**Figure 8-6**) are monitored:

- *Mirafra apiata* – Cape clapper lark – prefers Atlantis Sand Fynbos
- *Cercotrichas coryphaeus* - Karoo scrub robin – prefers Strandveld



These two species were selected due to their observed responses to bush encroachment recorded within nearby City of Cape Town nature reserves.

Monitoring should take the form of a monthly strip count. The count should be undertaken during a slow drive (no more than 20 km/h) from the main infrastructure node (at a designated start point, such as the ranger’s office) along the perimeter road as far as the beach near the Bok River estuary. Count each sighting of either of these two species during the drive. Note that these two species should only be counted during the monthly one-way strip count and no further data should be added outside of the monthly count. Staff tasked with this count should be equipped with at least one pair of 8x40 binoculars or similar.



**Figure 8-5: Cape Clapper Lark (Holger Teichmann - <https://ebird.org/species/caclar1>) on the left and Karoo Scrub Robin (Holger Teichmann - <https://ebird.org/species/kasrob2>) on the right.**

#### 8.2.3.4 SCC Monitoring

- EN and CR plant species – confirm the presence of each known individual once per annum by means of an active search.
- EN and CR animal species (excluding vagrant species) – confirm presence of the species by means of an active search if no ad hoc sightings have taken place for 12 months – request specialist assistance if required.
- Other threatened species – confirm presence of the species by active search if no ad hoc sightings have taken place for five years – request specialist assistance if required.

#### 8.2.3.5 Deliverables

The key deliverables due over the five-year planning period for biomonitoring are summarised below in **Table 8-2**.

**Table 8-3: Biomonitoring Tasks**

Management Activity	Timeframe
Provide staff with the computer resources, profiles and training required to log ad-hoc sightings and events on the Biodiversity Database and initiate protocol.	Year 1 - Ongoing
Install rain gauge at the main infrastructure node and water level measuring rod at the dam. Begin weekly rainfall and monthly dam water level monitoring.	Initiate in year 1. Continue weekly and monthly monitoring thereafter.

Install fixed point photography bases and take baseline photographs in each season for one year. Continue quarterly photography each year thereafter.	Initiate in year 1. Continue quarterly monitoring thereafter once in every three years.
Monitor indicator bird species by strip count. Capacitate staff by providing binoculars, bird books and a map of the route.	Initiate in year 1. Continue with monthly count thereafter.
Initiate annual monitoring of EN and CR plant species individuals/clumps one year after 'Bioblitz' is conducted.	Year 3

## 8.2.4 Vegetation Management

Maintaining and improving the health of the naturally occurring vegetation types and their associated fauna and flora communities is the foundation of biodiversity and ecosystem conservation in the Bokbaai NR. Management measures addressing the key vegetation-related issues raised in Section 6 above are provided in the sections that follow.

### 8.2.4.1 Thicket Management by Large Herbivore

Timeous reintroduction of large herbivores is the single most important vegetation management intervention indicated in this management plan. While reintroduction and management of the animals is addressed under the fauna section below, ensuring their effectiveness in maintaining the veld mosaic is a vegetation management concern.

Stocking rates and population levels are the primary factors determining impact on vegetation. Stock levels of between 6 and 12 ha per large stock unit (LSU) are typically advocated for stocking of strandveld vegetation types with domestic livestock, such that browse and graze are not negatively impacted. The habitat quality objectives for a stock farm and for a nature reserve differ however, and different areas of veld differ in their response to grazing and browsing. It is therefore recommended that a low stocking density be used initially, at approximately 10% of the lower rate indicated for domestic stocking. This works out to be approximately 1 LSU per 60 ha, or 17 LSU for the entire Bokbaai NR. Total stocking numbers should increase proportionally if the animals will be allowed to roam across the adjacent CapeNature land, and initial stocking rates should be defined by availability and by CapeNature. Thereafter, animal numbers should be allowed to increase naturally until such time as the desired veld mosaic is reached. It is recommended that Bokbaai NR engage with CapeNature and make use of their game stocking tool to ensure appropriate stocking rates.

The desired veld mosaic is between 50 and 80% open veld, and therefore between 20 and 50% thicket. Once the 20% thicket threshold is reached, the herd should be halved to allow the vegetation to recover. Should the 50% thicket threshold be reached, additional stocking should be considered, unless animal numbers are increasing quickly. Thicket cover should be estimated during management plan audits once in five years, based on aerial imagery, fixed-point photography and estimation during visual inspection of the site. Recommendations should be given on stocking rates during each audit.

### 8.2.4.2 Alien Invasive Flora

Bokbaai NR has been well maintained over the last decade in terms of alien invasive species and most of the reserve is in the maintenance phase. Only two areas require significant follow-up clearing, falling within management blocks 7, 9, 10 and 12. These areas are highlighted in **Figure 8-6** below. Although these areas are where most of

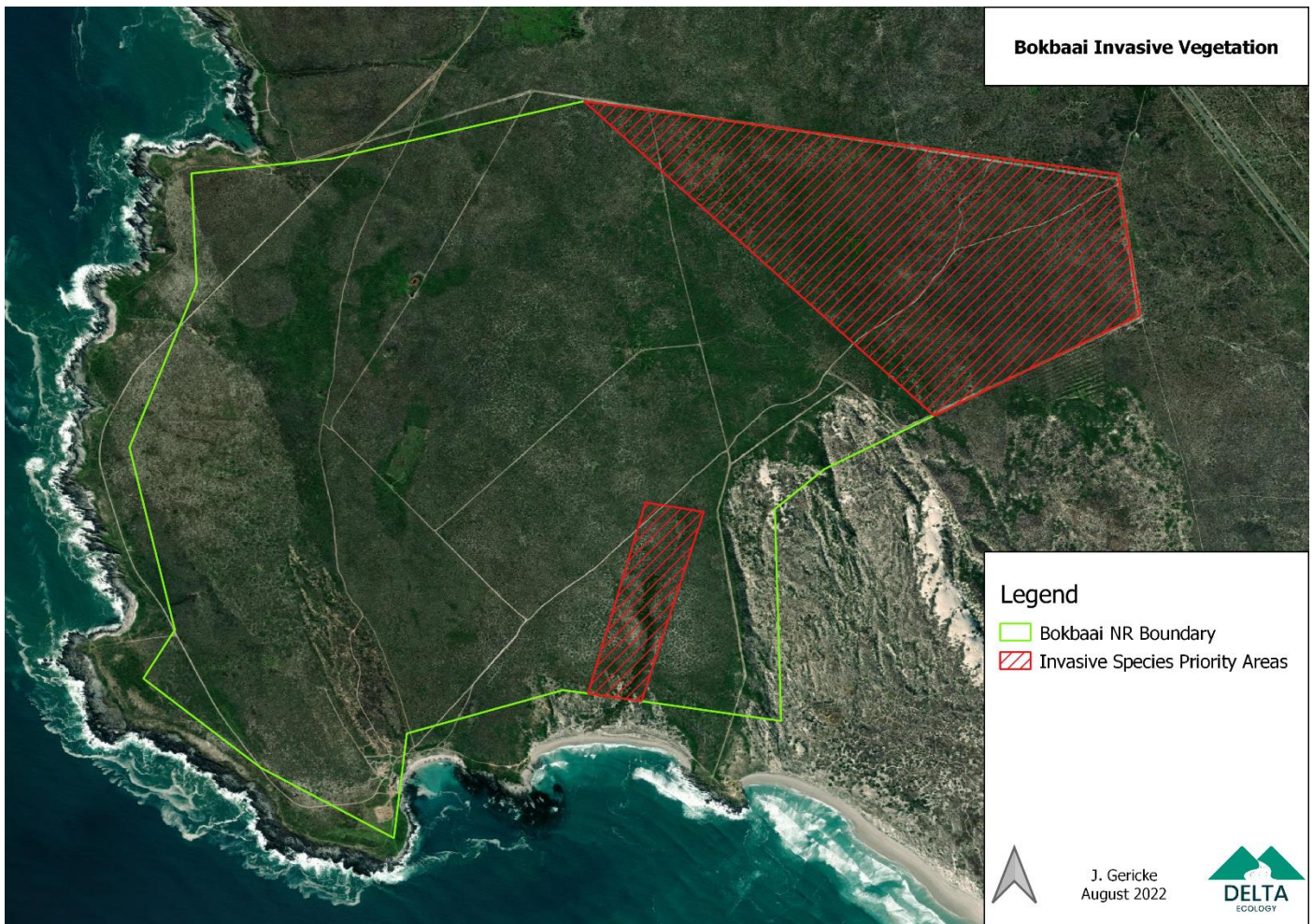


the work should be done, the other management blocks (blocks 1 to 6, block 8 and block 11) should be considered the highest priority since preventing reinvasion of clear areas is of utmost importance, followed by clearing of the invaded management blocks. The two focus species are *Acacia saligna* and *Acacia cyclops*. The proposed clearing actions are as follows:

- First undertake a full inspection of each block (1 to 6, 8 and 11) by road and then on foot to locate any individual or isolated woody alien invasive species. Mark each individual and group of specimens by creating a GPS point. Remove each individual specimen or any small groups that can be handled at the time and note larger groups for later follow-up. Ensure follow-up within 30 days. Repeat the full inspection annually.
- Second, undertake an inspection of the remaining blocks and clear all lightly invaded areas within each block as per the point above. Once lightly invaded areas have been cleared, continue with clearing of the more significantly invaded areas within the Bok River gorge and near the eastern fence. Repeat inspections and clearing once per quarter in these areas, until no woody invasive vegetation has been noted on inspections for two consecutive quarters. Inspect and clear annually thereafter.
- Should there be a wildfire or ecological burn, inspect the burnt area once per month and clear all *Acacia* seedlings. Continue until no seedlings are located for two consecutive months. Inspect once per quarter thereafter. If no seedlings are located after two consecutive quarterly inspections, continue with annual inspections.

Clearing methods for the two *Acacia* species depend on the size of the trees encountered. Seedlings should be pulled out by hand, with the roots. Saplings should likewise be removed in totality using a “tree popper” tool. Larger trees should be cut approximately 10 cm above the ground level. *Acacia saligna* will also require herbicide stump treatment when cut to prevent regrowth. This will require a 3% mixture of herbicide containing triclopyr as the active ingredient. Once the stump is cut, the herbicide must be applied to the cut stump by spray bottle or paint brush such that the cut end of the bark and outer layers are completely covered, ideally within 3 minutes after cutting, before the stump becomes sealed.

In block 4, the main infrastructure node, the *Manitoka sp.* should be phased out. Alternative, locally indigenous species for windbreaks and screens, such as *Lycium ferocissimum* (as frequently used to screen outspan areas historically) should be planted alongside the existing screens as soon as possible, and the *Manitoka sp.* should be cut back as the indigenous shrubs grow. The *Eucalyptus sp.* at the dam are to be phased out similarly with trees that provide shade for environmental education groups. While the vegetation types present are not associated with any indigenous tree species, extralimital but nationally indigenous trees such as *Searsia lancea* or *Searsia lucida* may be used. The historically planted *Araucaria heterophylla* at the main infrastructure node form part of the historical infrastructure and should not be removed.



**Figure 8-6: General locations of the majority alien invasive vegetation in the reserve.**

### 8.2.4.3 Prescribed Ecological Burning

The importance of re-establishing a natural or near-natural fire regime cannot be overstated. The role of fire in preserving biodiversity of these ecosystems, particularly the Atlantis Sand Fynbos vegetation type, includes stimulating seed release and germination of many species by application of heat and smoke, improving soil nutrient load and chemistry, and limiting thicket encroachment. Natural or optimal fire frequencies are a somewhat controversial topic, partly due to difficulty in identifying the natural or desired state of the vegetation. In general this is defined as the fire frequency that results in the highest overall species diversity, which usually requires natural or prescribed fire once the vegetation has become senescent. The controversy is compounded by the variation in time required to reach a senescent state between sites of the same vegetation type with changes in rainfall, slope, aspect, soil characteristics, wind and presence of game animals.

Estimates of natural fire frequency for sand fynbos vegetation types are typically in the 8-to-25-year range although estimates vary (Esler et al. 2014). The relationship between strandveld and the fire regimes of the neighbouring vegetation types is poorly understood, although natural historical fire frequencies are generally estimated to have been between 50 and 200 years (Rebelo et al. 2006). In conflict with this estimate, some strandveld sites have been observed to enter a clearly senescent state within 20 to 30 years of fire absence. Furthermore, in the absence of browsing and trampling by large herbivores however, thicket elements within the Strandveld tend to become dominant more rapidly than under natural conditions, with almost complete loss of the natural veld mosaic due to

thicket dominance having been observed within certain City of Cape Town nature reserves after 30 to 50 years of fire absence (pers. com. Dalton Gibbs). The City of Cape Town’s Biodiversity Management Branch presently uses fire as a tool to combat thicket encroachment in the absence of large herbivores and this approach has been successful.

The City of Cape Town’s Biodiversity Management Branch presently manages large tracts of Atlantis Sand Fynbos and the majority of the remaining Cape Flats Dune Strandveld and their recommended fire frequencies, based on experience and observation to date are provided in **Table 8-3**.

**Table 8-4: Typical fire frequency per vegetation type (pers. com. Dalton Gibbs)**

Vegetation Type	Fire Frequency
Atlantis Sand Fynbos	10 to 15 years
Dune Strandveld vegetation types	20 to 30 years
Succulent Dune Strandveld vegetation types	May not require burning, but do not prevent fire

Given the limited available comment in the literature as to the appropriate fire regimes for these specific vegetation types and given the wide degree of variation between sites, it is recommended that the decision to undertake an ecological burn be taken on advice from specialists with specific experience in the management of these two vegetation types. Such specialists may fortunately be found within the management staff of the adjacent CapeNature reserves and within the nearby City of Cape Town’s Biodiversity Management Branch, along with a handful of Cape Town-based consultants. It is recommended that the auditor appointed for the 5-yearly audits have personal experience managing one or both of these vegetation types and that opinions from other specialists within CapeNature and/or the City of Cape Town be acquired before a decision is made to proceed with ecological burns. The final decision as to whether a proposed block burn is warranted rests with CapeNature.

Each block should burn individually with a maximum of three blocks burnt each year, but the number of blocks burnt in each year may be reduced further if resources are not available, to a minimum of one block burn per year. Blocks 10 and 12 contain the majority of the Atlantis Sand Fynbos and the two should not burn in the same year.

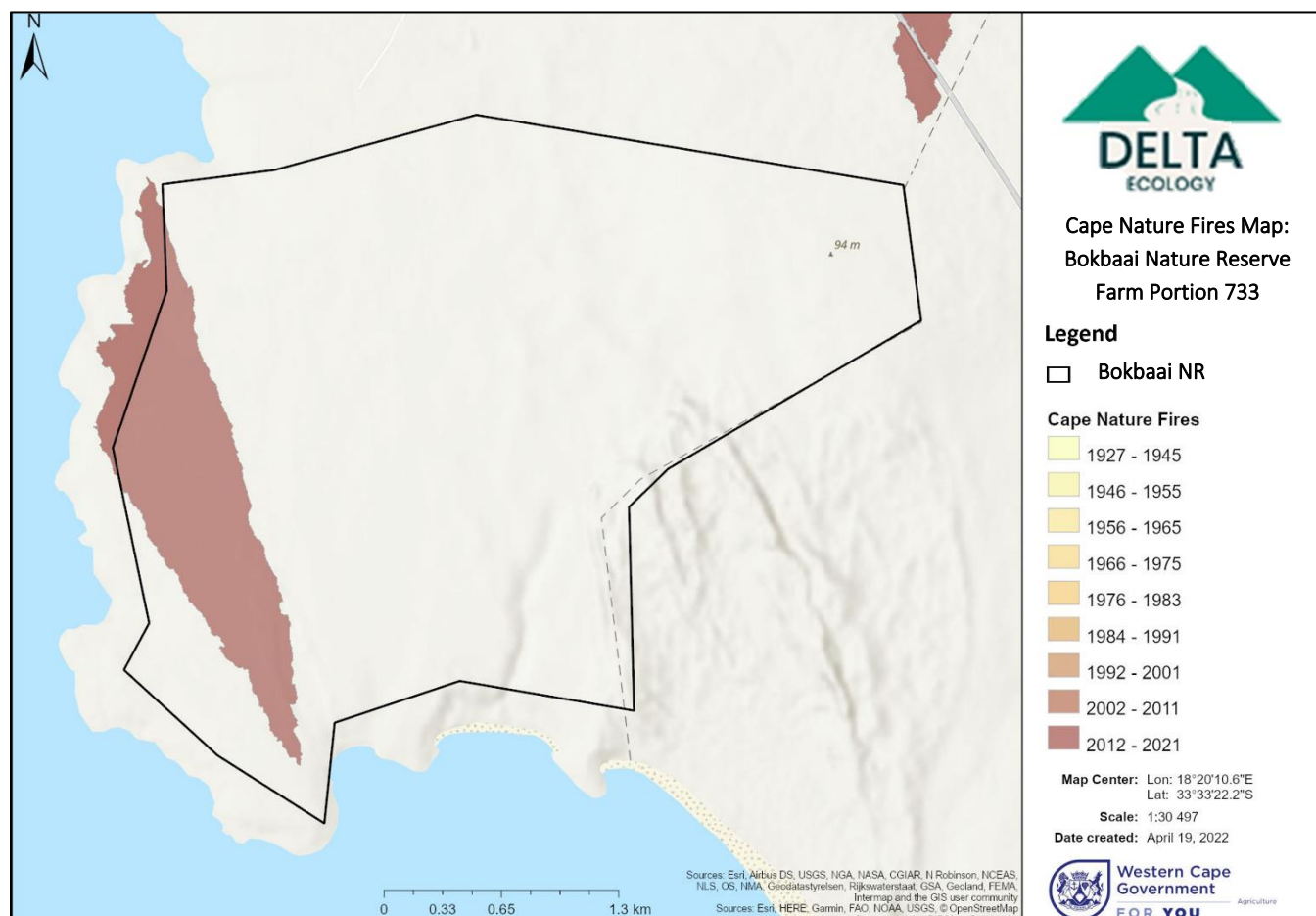
A burn schedule is provided in **Table 8-4** below that includes dates for each ecological block burn for three burn cycles for each block. The plan is based on the current veld age (since last burn or severe disturbance event – see **Figure 8-7** below), the vegetation type(s), the burn years of the adjacent blocks and the likely available budget. The plan should be implemented in its present form initially but must be updated should the veld age be reset by a wildfire, or should an external auditor indicate that a change is required due to the condition of the veld. The areas indicated as predominantly Atlantis Sand Fynbos have been given burn frequencies of between 10 and 15 years, while Strandveld areas have been given intervals of 20 to 30 years. Areas dominated by a mixture of both vegetation types has been given fire intervals of between 15 and 20 years.

Ecological burning should take place between December and March. A burn plan must be drafted for each ecological burn well ahead of time (at least 3 months before) detailing the ignition point and method, the fire breaks to be prepared, weather parameters required, the firefighting resources required and their deployment, along with contingency plans in case of emergency. Burn planning and operations must be overseen by a qualified Incident Commander of Grade Five or better class.



**Table 8-5: Prescribed ecological burn plan for Bokbaai NR management blocks**

Block	Veld Age	Priority	Burn Years (approx.)		
1	Mostly 30+ years old. Some (~15%) is 7 years old	10	2027/28	2052/53	2077/78
2	30+	8	2026/27	2051/52	2076/77
3	50% 30+ years old and 50% 7 years old	11	2027/28	2052/53	2077/78
4	1 year old (disturbed infrastructure block)	12	Do not burn - infrastructure risk		
5	30+	7	2025/26	2050/51	2075/76
6	30+	6	2025/26	2050/51	2075/76
7	30+	3	2023/24	2040/41	2075/76
8	30+	4	2024/25	2040/41	2075/76
9	30+	5	2024/25	2049/50	2075/76
10	30+	2	2023/24	2036/37	2075/76
11	30+	9	2026/27	2051/52	2075/76
12	30+	1	2022/23	2035/36	2075/76



**Figure 8-7: Only one fire has occurred in recent record, in early 2015, impacting management blocks 1, 2 and 3.**



## 8.2.4.4 Management Tasks

The key tasks in terms of vegetation management are summarised as follows:

**Table 8-6: Summary of key vegetation management tasks**

Management Activity	Timeframe
Stock large game as per Fauna Management section below, to reduce thicket encroachment and promote habitat diversity.	Year 2-4
Inspect and clear blocks 1, 2, 3, 4, 5, 6, 8 and 11 of all woody alien invasive species. Repeat annually.	Annually from year 1
Inspect and clear blocks 7, 9, 10 and 12, beginning with the lightly invaded areas, followed by more densely invaded areas. Repeat quarterly until two consecutive inspections fail to locate woody alien invasive species. Thereafter proceed with annual inspections/clearing for maintenance.	Initiate in year 1 and continue.
In the event of a wildfire or ecological burn, initiate monthly inspections and clearing until no seedlings are located for two consecutive inspections. Thereafter inspect quarterly until no seedlings have been located for two consecutive inspections. Thereafter proceed with annual inspections/clearing.	Ongoing
Plant indigenous and locally endemic, non-invasive windbreak/shade species in strategic locations to replace alien species at the camp site and at the dam. Remove alien trees when function is filled by indigenous species/	Year 1 - ongoing
Initiate and continue prescribed ecological burn regime in accordance with <b>Table 8-4</b> . Adjust schedule based on vegetation assessments during audits and in the event of wildfire.	Year 1

## 8.2.5 Aquatic and Riparian Systems

In terms of Department of Human Settlements, Water and Sanitation administrative areas, the Bokbaai NR lies in the Berg River catchment, which is part of the Berg-Olifants Water Management Area. It does not drain to the Berg River, but has a range of small wetland systems, the most substantial of which is the Bok River. Two of the smallest wetlands contain the SCC *Psoralea cf glaucena* specimens and should be considered highly sensitive systems. All of the wetlands (and the dam) are fed by shallow, localised aquifers, perched on calcrete. Abstraction from these shallow, localised aquifers must be avoided. It is unlikely that the existing borehole impacts the shallow aquifers however as it abstracts water from the main aquifer at far greater depth.

The wetland systems are threatened by:

- Climate change – reduced rainfall and resulting desiccation.
- Thicket encroachment – due to a lack of disturbance.
- Woody alien invasive species – which increase evapotranspiration rates in catchments, thereby reducing water availability.
- Developments on the reserve.

These threats are addressed by the activities indicated in the sections above and no additional, specific management measures are required.

## 8.2.6 Wildlife

The wildlife inventory at Bokbaai NR is presently very limited and improvement is addressed under the research and monitoring sections above. An interesting observation during fieldwork was the apparent dominance of

*Raphicerus campestris* (steenbok) and to a degree *Sylvicapra grimmia* (common duiker), which are associated with open vegetation, over *Raphicerus melanotis* (Cape grysbok) which is associated with thicket. This is indicative that the thicket encroachment observed has occurred relatively recently and that under past conditions, the vegetation exhibited substantially less thicket. This further highlights the need to address thicket encroachment.

### 8.2.6.1 Reintroduction of Large Herbivores

The only intervention in terms of wildlife planned presently is the reintroduction of large fauna species. Large herbivore species recorded in the coastal lowlands of this area at the time of European settlement included African elephant (*Loxodonta*), an extinct subspecies of black rhino (*Diceros bicornis*), hippopotamus (*Hippopotamus amphibius*), eland (*Taurotragus oryx*), Cape mountain zebra (*Equus zebra zebra*), ostrich (*Struthio camelus australis*), red hartebeest (*Alcelaphus buselaphus caama*) and grey rhebok (*Pelea capreolus*) (Radloff 2008). Bontebok (*Damaliscus pygargus*), African buffalo (*Syncerus caffer*) and blue antelope (*Hippotragus leucophaeus*) now extinct, which were also common in the Cape at the time were restricted to the coastal lowlands east of Kogelberg (Radloff 2008) and should be considered extralimital in the context of the Bokbaai NR.

Ostrich is already present within the reserve but have limited ability to combat thicket encroachment. Given the relatively low prevalence of grass in the reserve, browsers or mixed grazers/browsers such as elephant, black rhino, eland and (to some degree) red hartebeest would likely fair best in terms of diet, particularly initially. The reserve is insufficient in scale for elephant but would be sufficient for black rhino, eland and/or red hartebeest, particularly if allowed to roam across the adjacent CapeNature reserves as well.

The habitat is somewhat marginal for Cape mountain zebra due to their high grazing requirements, but they have been introduced successfully to similar habitat at Koeberg Nature Reserve. There is presently a low prevalence of grass in the reserve, but strandveld grazing is known to improve after the habitat is opened up, and zebra would do considerably better if introduced a few years after other larger fauna. The farm does however fall just outside the accepted natural distribution range in terms of the gazetted Birss *et al.*, (2018) Biodiversity Management Plan for Cape mountain zebra and in terms of the plan, introduction would not be allowed at Bokbaai NR. This should however be confirmed with CapeNature.

Black rhino would be the most effective species to reintroduce given their great bulk and ability to open thicket habitats, along with their preference for coarse or woody browse (Bothma & du Toit, 2010). Rhino are not presently a practical possibility however, as the capacity is not available to defend these against the scourge of poaching. A dedicated team of armed guards would be required at all times, particularly given the presence of abalone poachers in the area who would likely take advantage of a chance at acquiring lucrative rhino horn. The subspecies of black rhino historically present are also extinct, so it would only be possible introduce a close proxy.

Of the other possible species, eland have been shown to thrive in strandveld and even low nutrient fynbos vegetation types (particularly in combination) and have been highly effective at combatting thicket encroachment in Rondevlei, Blouberg and other nature reserves on the coastal plain. Given their bulk, they are likely to be the most effective of the remaining potential species and their reintroduction is a top priority.

Red hartebeest are mixed feeders who favour graze over browse. Habitat would be suitable for them and would improve further as eland or rhino open up the veld and grazing improves. Their reintroduction would therefore be a secondary priority and should follow introduction of eland by at least three years.

Eland are equivalent to 0.98 animals per LSU, while red hartebeest are equivalent to approximately 2.7 animals per LSU. As such, it is recommended that first stocking of Bokbaai NR should include approximately 10 red hartebeest (3.7 LSU) and 13 or 14 eland (13.3 LSU). These values may be scaled up accordingly should the animals be allowed to roam across Ganzekraal Nature Reserve. The stocking density at which the population is maintained should be determined during the 5-yearly management audits, based on the nature of veld mosaic as per the vegetation management section above.

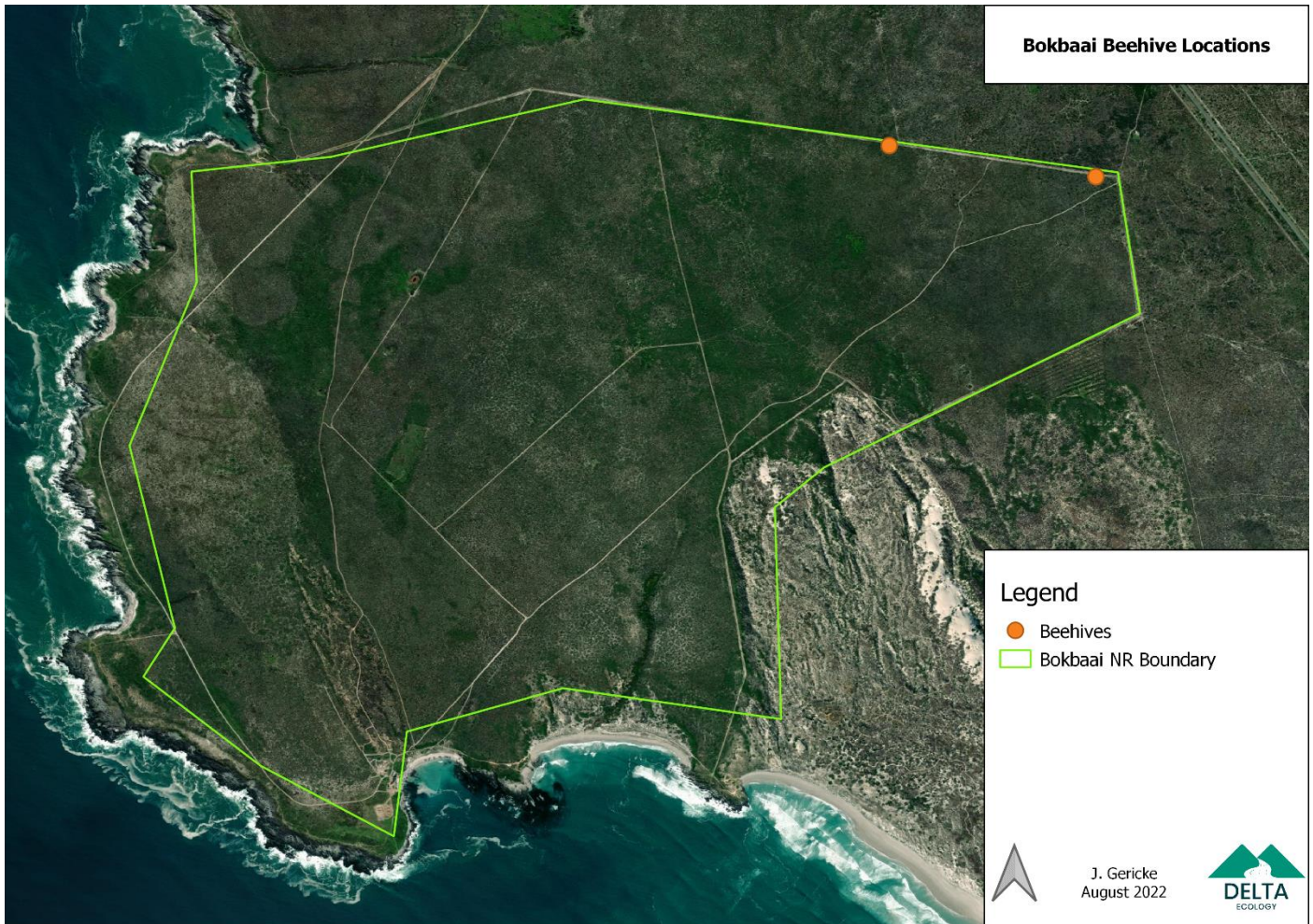
A key consideration before reintroducing larger game would be adequate fencing as required by the Game Translocation and Utilization Policy for the Western Cape (GTUP). Current Bokbaai NR fencing is low and does not present a barrier to large game, although it demarcates the landward boundary adequately. One option is to upgrade this fence to the required 2.4 m high game fencing. An alternative and preferable option would be to ensure that continuous game fencing is in place around Gaanzekraal, and to allow game to roam across both reserves. In both cases however, entrance gates across the public road may be necessary. Gates across a public road, as part of a private fence, are lawful in terms of Section 21 of the Fencing Act (31 of 1963) unless specifically prohibited by the relevant roads authority, but must be unlocked, at least 4.5 m wide, at approximate right angles to the road, or sound construction that facilitates opening and closing, and must be well maintained. It should be noted that failure to close such a gate after entry is an offence in terms of the same act.

Game species, stocking rates, fencing, sourcing, capture, translocation, acclimatisation and other considerations should be addressed in a specific game reintroduction and management plan for each species/operation, which must be approved by CapeNature before the operation takes place. Transport permits may also be required and these should be secured if needed beforehand. Stocking rate calculations may be undertaken by application of the Cape Nature stocking rate calculator, but direct veld assessments should remain the primary mechanism for determining whether an appropriate stocking level has been reached.

#### 8.2.6.2 Alien Invasive Fauna

The only alien and potentially invasive fauna noted at Bokbaai NR were the European honeybees at two locations as indicated in **Figure 8-8** below. The actual effect of European honeybees on local bees is not yet well understood, but preliminary research indicates significant negative effects, particularly on indigenous solitary bees. The precautionary and advised approach is to remove the beehives. The alternative approach is to use the reserve as a case study for research into the impact of European honeybees, and to make a decision based on research outcomes at a later stage.

While no other alien fauna species have been noted, it is likely that common alien species such as house sparrow and common starling are periodically present. All new invasive fauna sightings must be captured on the Biodiversity Database. Should invasive species become resident, these should be captured and relocated to an appropriate location outside of the reserve, or alternatively destroyed at the earliest opportunity, wherever practical to do so. If not practically possible to eradicate the species from the reserve within a single year, a control plan for the species should be drafted by a specialist and attached to the is management plan as an appendix.



**Figure 8-8: Beehive locations in the reserve.**

### 8.2.6.3 Management Tasks

**Table 8-7: Key Wildlife Management Tasks**

Management activity	Time frame
Ensure that complete, appropriate game fencing (including gates) is present around the entire Bokbaai NR <u>OR</u> , by agreement, around the entire Ganzekraal Nature Reserve such that game can roam freely.	Year 1 - 3
Introduce approximately 13 or 14 eland to Bokbaai NR.	Year 2 - 4
Introduce approximately 10 red hartebeest to Bokbaai NR.	Year 2 - 6
Remove beehives <u>OR</u> initiate research on impacts.	Year 2 - 4

### 8.2.7 Species of Special Concern

Monitoring of Species of Special Concern is addressed in the Biomonitoring section above. No specific management measures are to be undertaken at this time, beyond implementation of the general vegetation management measures indicated. However, should it be noted during monitoring that *Psoralea cf glaucena* is dying back within the wetlands due to desiccation, transplanting some affected specimens to wetter wetland areas should be considered and an expert consulted on the potential operation.



## 8.2.8 Illegal Harvesting

While illegal harvesting of marine life (particularly abalone and rock lobster) is rife along the Bokbaai coast, it does not present a substantial threat within the reserve boundary which does not extend into the marine environment. Illegally harvested marine life is however transported along the Farm Access Servitude that runs through the property. Given the risks involved in combatting this form of illegal harvesting, no specific measures are envisaged beyond reporting incidents to the SAPS and other relevant conservation authorities. Bokbaai NR should however assist and cooperate with Cape Nature and other government entities as far as reasonably possible while ensuring staff safety. Should an enforcement response plan be developed for the Dassen Coastal Complex, Bokbaai NR should collaborate as far as possible such that future responses are well coordinated with clear roles and responsibilities.

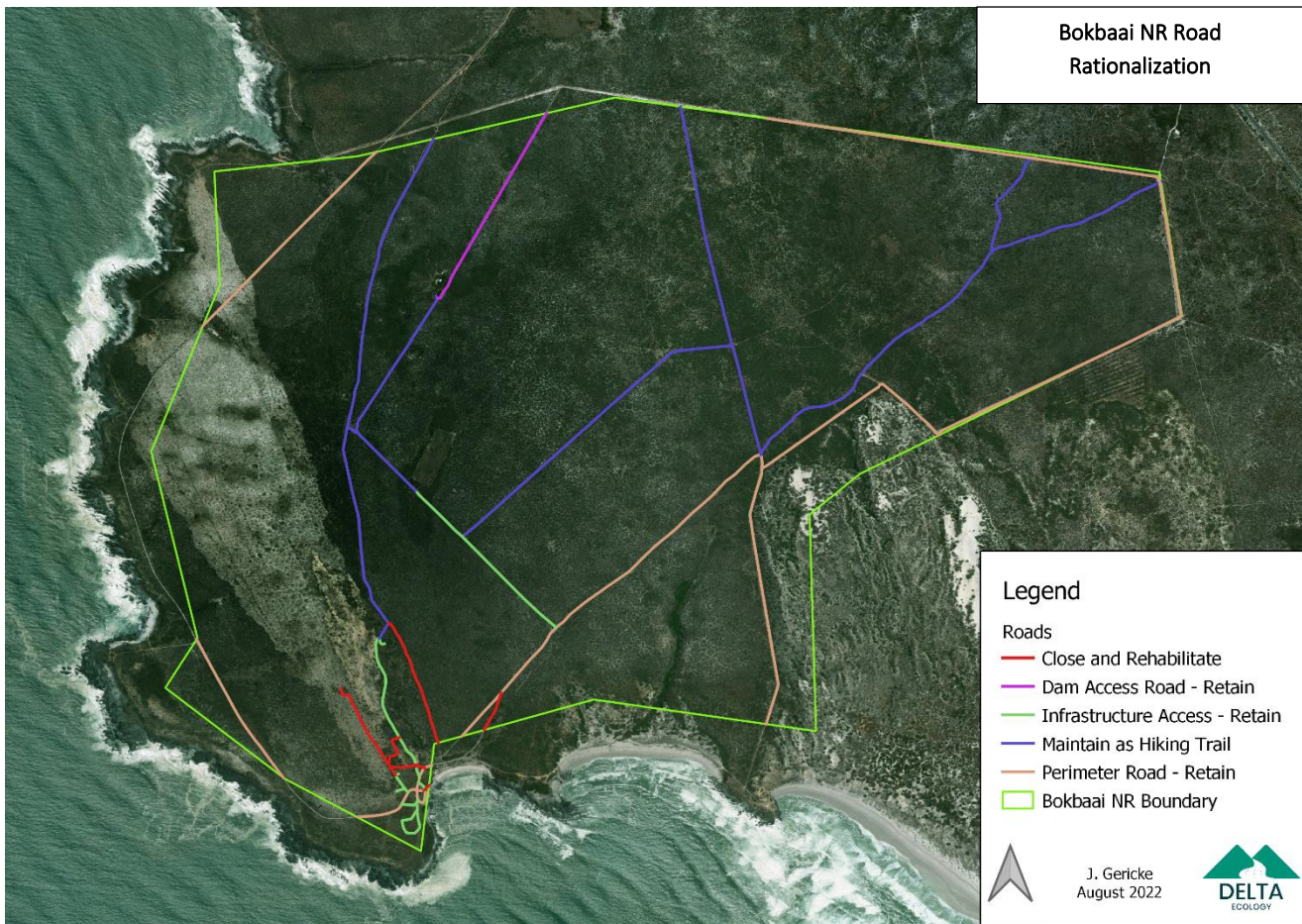
Illegal harvesting of vegetation or hunting of game animals is however likely to occur from time to time and security staff should keep a lookout for trespassers and for snares, particularly along the reserve fence. Actions at this time should be limited to fence and general reserve patrols, primarily as a deterrent, escorting of trespassers out of the reserve, and removal of any snares found. This section should be reviewed should illegal harvesting become a more significant issue or should prized game animals such as black rhino be reintroduced.

## 8.2.9 Rehabilitation and Restoration

Rehabilitation and restoration are key activities that allow an increase in available habitat across a nature reserve by converting disturbed, hardened or non-natural habitat to viable, ecologically active natural or near natural habitat. The Bokbaai NR provides limited opportunity for rehabilitation or restoration due to the high quality of the majority of the habitat on site. The following opportunities are present however.

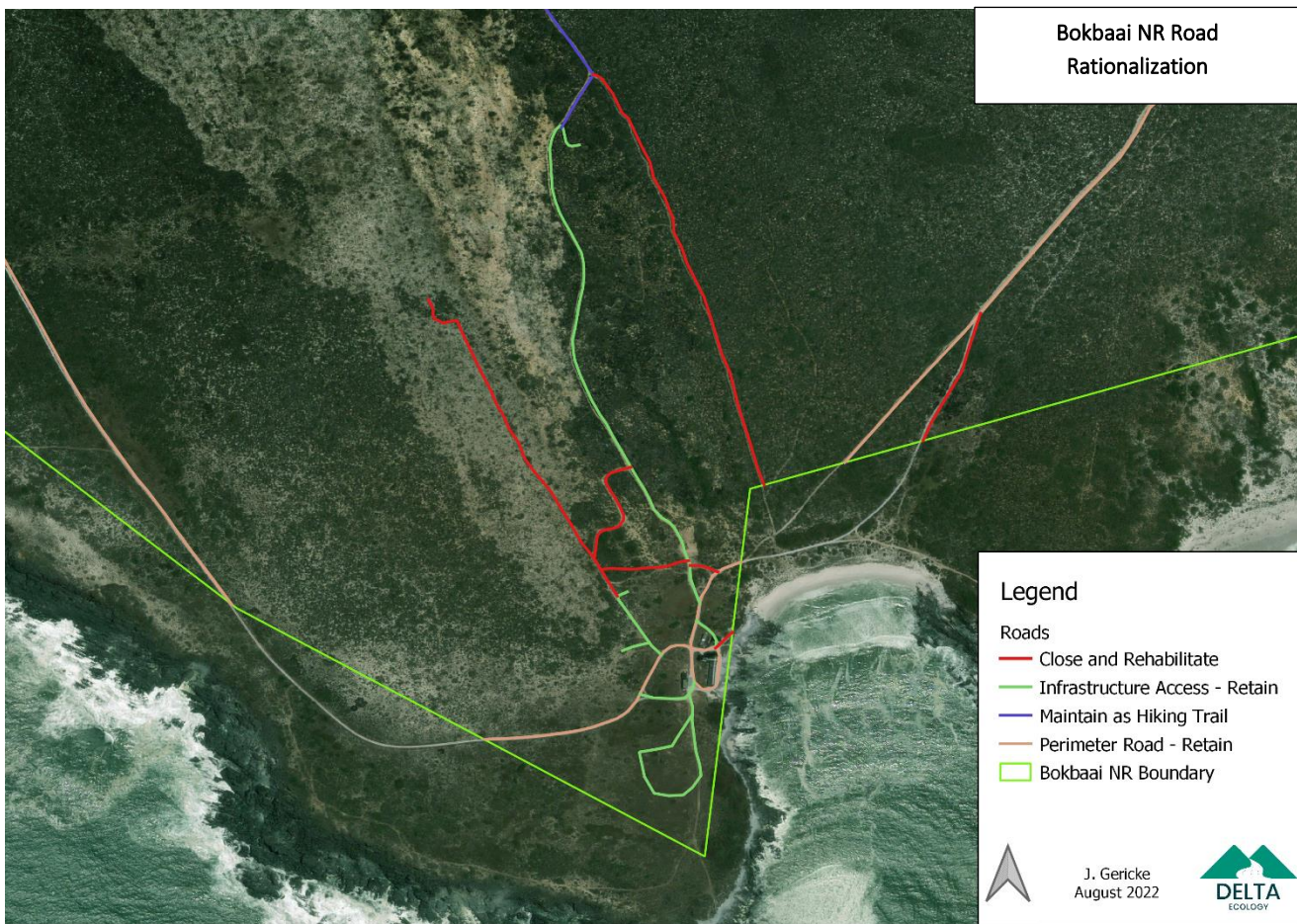
### 8.2.9.1 Roads

While vehicular access is essential across the reserve, many of the tracks established when the reserve was a working farm are no longer required. Some, like the perimeter track, are essential for maintaining fences, for fire-fighting access, security patrols, alien clearing and general reserve management duties Refer to **Figure 8-10**. Other internal roads are essential for accessing infrastructure such as the water treatment plant, pump station and dam (which will require maintenance). Other internal roads will only require occasional vehicular use during wildfires or ecological burn operations, but the remainder can be used as hiking trails and allowed to rehabilitate passively. Several roads can however be closed altogether and allowed to rehabilitate passively.



**Figure 8-9: Management objectives for internal roads and tracks.**





**Figure 8-10: Closer view of the roads in and around the infrastructure node.**

### 8.2.9.2 Main Infrastructure Node

Infrastructure at the main infrastructure node is presently used and necessary for environmental education and reserve operations. It is not recommended that any permanent infrastructure in this area be removed. It is worth noting that the new boys and girls camp sites, and the toilet block in between, has been constructed in a truly visionary manner in terms of the layout and landscaping. The toilet block has been constructed partially underground and is covered by soil that has been planted with locally indigenous vegetation. The final structure blends almost seamlessly with the natural surroundings and the habitat created on this disturbed site is already being used by local fauna. The site was previously highly disturbed, with cleared vegetation and infrastructure present prior to construction of the camp and toilet block, and the net impact on habitat has been positive.

### 8.2.9.3 Parking Areas

Two degraded areas used by fishermen for parking were noted. One lies on the boundary of the Bokbaai NR, and the other just outside along the coast. Refer to **Figure 8-11** above for locations.

The parking area within the reserve includes tracks that extend over 150 m off the road into an old wetland that was once mined for calcrete. It is not viable to rehabilitate the mined area without borrowing soil from adjacent areas and expanding the zone of degradation and likely causing more damage than good. It is however possible to control vehicle access and allow the wetland soils to reform naturally over time. It is essential that formal parking bays be demarcated alongside the road and that the wetland be cordoned off.

The second parking area does not fall within a wetland, but the disturbance zone does appear to be expanding. This area was also historically disturbed, with excavated areas and old soil mounds evident. Parking bays adjacent to the road should be demarcated, and the rest of the disturbed area covered with sediment from the soil mounds, cordoned off and allowed to rehabilitate passively. This parking area does not fall within the NR boundary and addressing rehabilitation of this site is therefore not mandatory for Bokbaai NR. It should also be done in consultation with CapeNature if taken on by the Bokbaai NR.

#### 8.2.9.4 The Dam

The old agricultural dam has been invaded by *Typha capensis* between 2009 and the present. The dam appears to be free of *T. capensis* in all historical imagery prior to this date and was likely introduced either by wind-blown seeds or by transportation of seeds from another location. *T. capensis* is unlikely to have been indigenous to the wetland in which the dam was excavated given the seasonal/temporary zonation that would have been present prior to excavation.

*T. capensis* proliferates extremely quickly and tends to fill the available habitat rapidly. The *T. capensis* in the dam lined the northern and eastern banks in the first year, and this pattern remained until 2015. In 2016 and 2017, during the height of a severe drought, the other banks were also colonised, completing a full ring around the dam. The width of the ring remained constant until late 2019, whereafter the *T. capensis* encroached rapidly inwards, covering almost the entire dam by September 2022, leaving very little open water.

It is likely that this recent proliferation is not exclusively due to time, but to changing conditions in the dam as well. *T. capensis* has specific habitat needs and requires permanently saturated soils within the upper 50 cm, and cannot tolerate surface water depths beyond approximately 0.5 m. It is likely that the constraining factor in previous years was water depth, indicating that the water level receded during the drought, and has continued receding since. This is in keeping with the other observations indicated in the Climate Change section below.

Retention of the dam as a reserve feature, particularly in the context of climate predictions for the area, will require control or eradication of *T. capensis* as a priority.

#### 8.2.9.5 Old Reservoirs

Two old concrete reservoirs remain disused within the reserve. While not a high priority due to the small scale of these structures, they should be removed in due course as they do not perform a function and could be replaced by natural vegetation. The structures will need to be removed by bulldozer or similar heavy vehicle, with care not to disturb vegetation compact soil adjacent to the structures. Once the structures are removed, the soil should be replaced and smoothed, ripped to a depth of 30 cm, and allowed to rehabilitate passively. After the disturbance, the site should be inspected regularly for invasive species as per the protocol post fire.

#### 8.2.9.6 Historically Ploughed Field

According to historical satellite imagery, natural vegetation had colonised the site to a large degree by 1985, which indicates that it was last ploughed decades ago. The disturbed site is however still clearly visible on current (2022)



satellite imagery and the vegetation is markedly different in this area, lacking the diversity of the surrounding vegetation (Figure 8-12).

Ploughed fields have typically been subjected to compaction, topsoil loss, and nutrient enrichment. These impacts are difficult to address actively. Potential interventions are costly and have limited success rates and are therefore not planned. Natural processes, such as bioturbation, grazing and browsing will redistribute nutrients, reform topsoil and reverse compaction, and these processes are presently acting on the site. It may be expected however that rehabilitation will take a very long time.

Old fields are prone to rapid invasion by species such as *A. saligna* and *A. cyclops*, and the disturbance and soil chemistry changes associated with these species would reinforce the past disturbance and prolong the rehabilitation process. Ensuring that these species do not colonise this site should therefore be a high priority for the reserve. Reintroduction of large herbivores would furthermore increase the rate at which nutrients are redistributed and diluted across the landscape, thereby increasing the rate of passive rehabilitation.



**Figure 8-11: Vegetation within the old field (left) with vegetation more representative of the area along the edge to the right.**

### 8.2.9.7 Management Tasks

**Table 8-8: Summary of rehabilitation and restoration tasks**

Management Activity	Timeframe
Close roads in 'red' to all traffic as per <b>Figure 8-9</b> . Install "rehabilitation in progress" signs and physical cut brush (from alien clearing) or pole barriers along the entrances.	Year 1 -2
Close all roads in 'blue' to all vehicle traffic as per <b>Figure 8-9</b> by informing staff.	Year 1-2
Lay out, clear and demarcate parking bays adjacent to the road at the two parking areas. Close the remainder of the disturbed areas by installing a physical pole barrier. At the southern site, spread the soil from the mounds across the site by hand. Install "rehabilitation in progress" signs and allow to rehabilitate passively.	Year 4 -8
Control <i>Typha capensis</i> in the dam.	Year 1-2
Remove old concrete reservoirs. Monitor for and clear woody aliens as per protocol post fire.	Year 5 -10

## 8.3 Sustainable Utilisation of Natural Resources

There is limited apparent public desire for the harvesting or utilisation of natural resources at Bokbaai NR. The nearest residential community is approximately 3.5 km to the north at Grotto Bay and consists of high-cost holiday and retirement homes. With the exception of recreational resource harvesting by hunting and fishing, most natural resources provided by nature reserves are of low value per volume and are usually only sought by low-income communities. The nearest low-income community is located at Mamre, nearly 10 km to the east. Transport costs from Bokbaai NR to Atlantis further reduce the net value of any potential natural resources.

The reserve does not offer much in terms of harvestable natural resources. It has small quantities of *Restio* species that can be used for thatching, small amounts of *Typha capensis* reeds that can be used for constructing baskets and similar items, low densities of harvestable game birds and animals, and a little wood in the form of remaining *Acacia* and *Eucalyptus* trees. None of the resources are available at a scale that would render them economically viable. The adjacent coastline offers fish and other resources and is accessed via the reserve, but does not fall within the reserve boundary.

The greatest resources offered by the reserve are not harvestable resources, but the intrinsic natural, cultural and aesthetic value. These aspects can be monetised in a sustainable manner by means of responsible tourism. It is not however the goal of the Mapula Trust to make the reserve profitable. Rather it is their intention to maximise sustainable use of the reserve's natural resources by using the reserve for environmental education purposes.

### 8.3.1 Environmental Education

A central part of the vision for the Bokbaai NR is to offer environmental education facilities for underprivileged and underfunded schools in the Western Cape. They have partnered with the Nature Connect NGO who arrange school groups and run highly professional, effective environmental education programmes. The unique beauty and biodiversity features of the reserve together with its rich heritage make it an ideal location for the environmental education. Additional tourism facilities are not currently envisaged for the reserve.

The reserve has recently been outfitted to cater for large school groups. A tented camp for up to 40 students has been constructed with ablution facilities, along with a kitchen and accommodation for camp staff. The

historic Bokbaai farmstead has been repurposed into a museum and environmental education centre/lecture room. A borehole, water treatment plant and sewage treatment facility have also been added/upgraded to cater for school groups. A bird hide in a strategic location has been recommended in this management plan.

With infrastructure in place, it is worthwhile ensuring that environmental educators are aware of the opportunities offered by the reserve. It is recommended that a brochure be produced with a reserve map, a list of interesting natural and historical features (also on the map) and ideas for environmental education activities. This should be provided to environmental educators to ensure maximum use and impact. Some potential high impact educational activities and actions are as follows:

- Provide external signage at the infrastructure node on the heritage value of the buildings and farm, the ecological value of the reserve and the coastline for passing visitors. Rules and regulations for fishermen (from the Marine Living Resources Act) should also be displayed and signage may be provided by the Department of Forestry, Fisheries and the Environment.
- Maximise use of the reserve for environmental education by providing a list of opportunities to Nature Connect and other partners such as:
  - Point out the wetlands that are desiccating and the estuary mouth that is clogged with *T. capensis* as tangible victims of climate change.
  - Sandy beach and rocky shore ecosystems could be explored.
  - Hike the old wagon road with school groups. This will allow demonstration of both the Atlantis Sand Fynbos and the Cape Flats Dune Strandveld vegetation types, along with an immersive feeling of what life was like for the farmers of the day bringing produce to Bokbaai for trade. Stop off at the old outspan to complete the experience. Allow the old roads to grow closed as far as possible along this circuit such that trails become more primitive and the sense of remoteness is enhanced – as per the infrastructure rationalisation section above.
  - Take school groups for a hike to the bird hide at the dam passing the coastline and inland areas. Provide bird checklists with common bush, coastal and aquatic species listed. Have a friendly competition to see who can spot the most bird species. This activity provides an opportunity to discuss and reinforce the idea that that each habitat type is associated with a discreet set of faunal species.
  - A comparative bird checklist activity could be undertaken with older school groups that generates bird lists for the Cape Flats Dune Strandveld and Atlantis Sand Fynbos vegetation types.
  - Use the dam for sampling aquatic fauna with school groups and apply the Mini-SASS protocol.
  - Undertake pitfall trap, small mammal and cover object surveys regularly with school groups so as to connect the learners with seldom seen fauna of the reserve while also generating useful species data.
  - Visit threatened plant species (such as *Psoralea cf glaucena*) and discuss habitat requirements and why these species are threatened.

Use of these opportunities as appropriate would demonstrate biodiversity and the need to conserve representative ecosystems of each type. It would also generate interest in the natural ecosystems, provide a sense of history and raise a variety of historical social issues that are of relevance to South African and global societies today.

### 8.3.1.1 Management Tasks

**Table 8-9: Environmental Education Tasks**

Management activity	Time frame
Provide information on reserve features of education importance to environmental education partners, including suggested activities.	Year 1
Develop, produce and install educational signage at the main infrastructure node primarily for fishermen	Year 2 - 3

## 8.4 Socio-economic Development

Protected areas are most often located in rural districts where poverty and associated social issues are prevalent. Protected areas could thus potentially contribute to socio-economic development in the districts surrounding reserves. Very high levels of poverty and unemployment persist in the Mamre and Atlantis communities, which is located less than 10 km from the Bokbaai NR. While large staff components and substantial economic opportunities are not envisaged for the reserve, given the environmental education focus, the Atlantis community should be the primary source of reserve staff and service providers where possible. Specific actions should include marketing of temporary and permanent reserve staff positions directly to the community. Opportunities for the provision of services such as landscaping, alien clearing or other tasks should likewise be advertised to small business in the Atlantis area where possible.

The primary contribution to socio-economic upliftment that will be made by Bokbaai NR is by providing high quality environmental education facilities supporting programmes that will attract local and international funding, thereby creating jobs in the environmental education sector. The jobs will be held primarily by partner organisations such as Nature Connect.

No specific management actions are advocated for promoting socio-economic development, beyond the normal operation of the reserve in accordance with the vision.

## 8.5 Heritage Features

The Mapula Trust is not only a custodian of the Bokbaai NR in space, but also in time. The farm on which Bokbaai NR is located has considerable historical, social, aesthetic, architectural, cultural, and contextual significance which extends beyond the predominantly scientific environmental emphasis referred to in the reserve proclamation. The property is deemed a provincial heritage site and was declared a national monument in 1971. The heritage features of the site deserve to be protected for intrinsic reasons as well as for the benefit of future generations. The management of cultural heritage features contributes to the promotion of culture and heritage through conserving and providing access to significant heritage resources for the benefit of visitors and the broader community alike.



The Bokbaai farmstead is located on the coast, on the only portion of this farm that extends to the ocean. This farmstead is in remarkably good condition for its age with minimal modifications having been done to the original buildings. The homestead, long outbuilding, the structure referred to as the old “jail” and a cottage located on the property all date from the late 18th, early 19th century while the stables were built in the 20th century (Figure 8-12). While pre-colonial archaeological resources have been found to occur on the reserve, they generally have only minimal surface traces. Specialist assessments in this regard were conducted during the EIA process (and subsequent development) for this site in 2017 and further archaeological assessments are not required.

A possible outspan area (see Figure 4-7) was however located during fieldwork prior to the drafting of this plan and should be investigated by an archaeologist. The addition of an outspan to the list of heritage features would be significant. It’s addition to an environmental education itinerary would be even more impactful. It would allow children to visualise the experience of bringing goods to the bay to trade with the ships by ox wagon. It would also allow them to observe the impacts of nutrient enrichment on the soil and vegetation which is still evident today after hundreds of years. This brings home the message that our actions today have impacts that change a landscape for many generations.



**Figure 8-12: Aerial view of Bokkerivier farmstead overlooking Bokbaai (Winter & Baumann, 2017).**

The combination of historical, environmental, architectural and aesthetic criteria has contributed to the overall heritage significance of the farm. The establishment of the environmental education centre on this property will have a positive heritage impact as the historic structures have been refurbished and are being reused in an appropriate adaptive manner which promotes enjoyment and appreciation of the place by a range of school learners and researchers. In addition, the environmental education centre will make the complex and diverse history of the farm more accessible, particularly to school children, but also to the broader local communities. In addition to the on-site environmental education programme, cultural heritage programmes within the Dassen Coastal Complex (of which the Bokbaai NR is part) are implemented through a Landscape Education Programme.

## 8.5.1 Management Tasks

**Table 8-10: Heritage Tasks**

Management activity	Time frame
Ensure that heritage information and experiences are incorporated into environmental education information brochure/booklet for partners.	Year 1-2
Arrange for specialist to verify outspan location.	Year 2 - 4
Maintenance to heritage buildings should be done in a way that preserves the heritage value of the buildings. To ensure the heritage value of the building is not degraded.	Ongoing

## 8.6 Management Authority Effectiveness and Sustainability

All management plans provide a vision and objectives, along with task lists designed to achieve these. In addition, it is exceedingly important that the resources and processes required to complete the tasks effectively are also in place which is an aspect often overlooked in planning.

### 8.6.1 Legal Compliance

The Managing Authority is required to comply with all provisions of South African law. Apart from the general provisions, certain legal requirements are applicable specifically to their role as the landowner and Managing Authority. These include:

- Implementation of the agreed management plan and its reporting requirements in fulfilment of NEM:PAA provisions.
- Adherence to NEMA, SEMAs and EIA regulations and processes for development.
- Adherence to NWA and relevant associated regulations related to abstraction from water resources, discharge of or irrigation using treated effluent and development within 500 m of a wetland.
- Adherence to Veld and Forest Fire Act by maintaining membership to the Greater Cederberg Fire Protection Association, by maintaining fire breaks at the property boundary (or where dictated by agreement with the adjacent landowner) and by clearing alien invasive species in accordance with this plan.
- Adherence to National Heritage Resources Act.

No specific actions are required at this time to ensure legal compliance with the above provisions as no current issues of non-compliance have been noted.

It is however recommended that the Mapula Trust provide written instructions to security staff stationed on the reserve regarding the delegation and limitation of arrest, search and seizure powers in terms of the Criminal Procedures Act, including the use of force, on behalf of the Mapula Trust as the landowner. The limitations imposed by the Mapula Trust and the procedures required for certain actions, such as requests for authorisation from the Mapula Trust, must be clarified.

### 8.6.1.1 Legal Compliance Tasks

**Table 8-11: Legal Compliance Tasks**

Management activity	Time frame
Ensure that security staff understand the nature and limitations of the landowners power of arrest, search and seizure as per NEMPAA delegated to them by management authority.	Year 1

## 8.6.2 Infrastructure and Equipment

The Bokbaai NR requires adequate infrastructure and equipment to achieve the stated management objectives. The infrastructure and equipment also needs to be kept in good working order.

### 8.6.2.1 Infrastructure and equipment needs

The following infrastructure, tools and equipment items that may enhance the efficiency of current duties or may be required to undertake new tasks in terms of this plan have been identified. Some of the equipment items may already be available to staff, but this should be verified. The various needs, in order of priority, area

#### *Infrastructure*

- A workshop building with permanent storeroom and enclosed work yard - This should be constructed in a manner that is aesthetically coherent with the rest of the reserve. The workshop must be sufficient for all foreseeable future needs.
- A bird hide at the dam, scaled to accommodate either 20 or 40 children plus environmental educators. The bird hide should face the dam and blend in with the landscape as far as possible through the use of natural materials.

#### *Equipment*

- Access to a common smartphone-based mapping programme. Locus maps is a good option, but many other free options are available.
- A basic computer for logging sightings and events on the biodiversity database.
- At least one pair of 8 x 40 or similar binoculars for indicator bird strip counts.
- “Tree popper” tools (one or two) for easy removal of saplings without herbicide.

### 8.6.2.2 Maintenance Arrangements

Infrastructure and equipment may be rendered useless by a lack of equipment. The following maintenance procedures will be required.

- Draft a list of vehicles and other equipment items that require regular servicing of maintenance procedures and create a schedule.
- Create a prioritised list of other equipment that needs repair or maintenance work.

- Draft a prioritised list of infrastructure maintenance tasks.
- Ensure that each maintenance task is delegated to a specific staff member.
- The Managing Authority must inspect equipment and infrastructure at least once per year to ensure that all infrastructure and equipment is well maintained such that it is functional, safe and aesthetically sound.

### 8.6.2.3 Management Tasks

**Table 8-12: Infrastructure and Equipment Tasks**

Management activity	Time frame
Plan and construct a workshop adequate for reserve needs. Ensure compliance with environmental regulations.	Year 1 - 4
Plan and construct a bird hide at the dam. Ensure compliance with environmental regulations.	Year 3 - 6
Select and install smartphone-based mapping application or provide GPS unit to field staff. Provide training and geographical data required to implement this management plan.	Year 1
Ensure that field staff have access to a computer with an internet connection for logging ad-hoc sightings and for loading/downloading geographical data.	Year 1

### 8.6.3 Financial Management

Bokbaai NR is not a registered commercial entity and is wholly owned, managed and financed by the Mapula Trust. No commercial activities take place on the reserve. No entrance fee is charged and the Mapula trust does not generate income from any environmental education or other activities. As such, the reserve does not engage directly in substantial financial management.

The reserve, as a Mapula Trust project, is allocated a budget that is based on the needs of the reserve and the availability of funds. It is, and should be, prioritised such that staff salaries are covered first, and the remainder of the available budget is spent as per the APO, in order of priority. Staff salary payments, income generation, tax, CPIC reporting and other financial management tasks take place at a broad Mapula Trust level, rather than at reserve level and is therefore beyond the scope of this management plan. The key task required for adequate financial management of the reserve however is the drafting of a detailed and APO to determine annual budgetary needs.

### 8.6.4 Signage, Access Control and Security

It is essential to maintain long term integrity of the reserve and to manage visitor activities and flow that the reserve boundary be clearly and adequately demarcated, and that rules and regulations be clearly communicated to all visitors (**Table 8-10**). A boundary fence is an essential starting point. The fence does not need to be substantial to fulfil this role and the existing low, multistrand fence is adequate, while still allowing large animals to move over the fence and smaller animals to move through the fence when travelling to and from the adjacent CapeNature reserve. This form of fencing is also much less prone to theft than more substantial types of fencing. It may however be replaced with game fencing if required.

There is ample empirical and anecdotal evidence that a well-maintained fence generates a higher level of respect for reserve rules, regulations and integrity. Dilapidated or rusty fencing has in various studies been associated with substantially higher rates of illegal harvesting, land invasions and petty crime. It is therefore an important



component in securing any reserve that the fence be maintained to a high standard. Ensure that the following takes place at Bokbaai NR:

- Conduct fence patrols at least 3 times per week, but ideally more often.
- Undertake emergency fence repairs before nightfall of the same day.
- If emergency repairs are not neat and of equivalent standard to the rest of the fence, replace the emergency repairs with formal repairs that are up to standard within one week of locating the breach.
- Repair any minor wear-and-tear issues along the fence as soon as practically possible, but within two weeks at the most. Such issues may include significant rust damage, fenceposts that are leaning over to one side, strands that are no longer affixed to the poles or strands that are no longer held straight under tension.

An entrance gate may be placed across the public road if required for game management purposes but access to the public road may not be restricted and the gate must remain unlocked. The public road presents a security risk however and attempting deproclamation of the road as a public road is a high priority task. This is a long-term process however and it may not be successful, so this risk factor must be taken into account in the interim.

The next priority is to ensure that proper signage is in place at the entrance, adjacent to the public road. The sign must clearly indicate the reserve name, emergency contact details and should list the rules and regulations for visitors. Thought should be given to the rule and regulations to be displayed at the gate and all essential and common aspects covered. These may be written or in pictogram form. The existing entrance sign should be evaluated in terms of suitability and presentability and should be replaced if needed. Entrance signage should be evaluated during future management reviews/audits and updated if required. Educational signage is dealt with elsewhere in the plan. It should however be maintained to a high standard, as per the entrance signage.

On-site security presently consists of two armed security-focussed rangers supplied by a security service provider. Given the scale of the site, two rangers is likely to be sufficient to ensure a reasonable level of safety during camps, to ensure infrastructure is not vandalised, burgled or stolen and to respond to incidents when they occur. With the present declining GDP per capita and increasing poverty in South Africa, petty or more serious crime focussed on procuring food or income may become more commonplace. Introduction of large, conspicuous game such as eland may lead to an increase in illegal harvesting attempts. It is important therefore to re-evaluate the security needs at the reserve at regular intervals (i.e., during 5-yearly audits), after any concerning incident, or after a substantial change in the reserve such an introduction of potentially valuable animals. Should black rhino ever be considered for reintroduction, the security situation should be carefully evaluated and planned for. All security incidents must be logged in an incident book and on the online repository (e.g. the Biodiversity Database calendar). Incidents must be categorised by offence such that statistical analyses may reveal trends.

**Table 8-13: Signage, Access Control and Security Tasks**

Management activity	Time frame
Ensure that the boundary fence is patrolled at least three times per week.	Ongoing
Ensure the fence line remains intact, and in a neat and presentable condition. Make any necessary repairs timeously.	Ongoing

Ensure that entrance signage clearly displays the name of the reserve, emergency contact details and relevant reserve rules/regulations.	Year 2 – 3, then ongoing maintenance as required.
Maintain records of unlawful activities. Ensure incident register is used consistently and online records are periodically updated.	Ongoing, with annual updates
Attempt to de-proclaim the public road such that access control can be more adequately exercised in future.	Year 2 - 10

## 8.6.5 Firefighting

The vegetation types within the Bokbaai NR are fire prone and fire driven. Although adhering to a prescribed ecological burning schedule will reduce the frequency of wildfire substantially, wildfires will occur from time to time. The Veld and Forest Fire Act furthermore puts the onus on the landowner to take reasonable steps to prevent wildfire from spreading to neighbouring properties. The following measures are advocated.

### 8.6.5.1 Fire Breaks

Fire breaks of approximately 8 to 10 m wide have been cut along the boundary fence and include the boundary road. Firebreaks of similar width have also been cut around the main infrastructure node. See **Figure 8-13** and **Figure 8-14**. These firebreaks are not complete however and it is recommended that they be extended to the coast as per **Figure 8-14**, with permission from the landowner as these extensions fall seaward of the Bokbaai NR boundary.

At present, the firebreaks represent much needed areas of disturbance in a largely closed landscape. However, once the landscape opens up after introduction of large game animals and establishment of a prescribed ecological burning regime, the habitat value of these areas will be diminished. Once this has occurred (likely after five years or so), it is recommended that the outer firebreak be re-negotiated with CapeNature and reduced to only the boundary road to limit unnatural disturbance in a naturally disturbed landscape.

Firebreaks serve two purposes. Firstly, they serve to slow and cool an approaching fire so that firefighting effort can be applied more effectively. It is important to note they seldom stop a fire altogether and require firefighting effort to be effective. The second and most important purpose then is to provide access for firefighting vehicles to the fire front. Firebreaks that incorporate a road or track, such as the one along the outer fence, are therefore the most effective as they allow for rapid, easier access. The minimum internationally recommended firebreak width is 1.5x the maximum expected vegetation height, which in this case would call for a width of approximately 3 to 4 m. This standard works well in forest but does not apply as well in fynbos and strandveld vegetation types. This width would place fire vehicles immediately adjacent to burning vegetation of over 2 m in height in places, which with a strong wind and dry conditions can create flame heights of over 6 m and generate sufficient radiant heat to restrict firefighter access, melt vehicle paint and plastic parts and potentially cause vehicles to ignite. The existing width of 8 to 10 m is preferred as it allows vehicles to access and cool the fire front while keeping a distance of 5 m or more away, thereby experiencing substantially reduced radiant heat.

It is unfortunately not practically possible to align the infrastructure node firebreak with existing roads to a greater degree than is already the case. Firebreak maintenance prior to and during fire season will be important

along both firebreaks but will be particularly important along the infrastructure node firebreak. The following firebreak maintenance measures should be implemented.

- Cut firebreaks by tractor in September each year. Ensure that the resulting firebreak makes vehicular access possible. The vegetation should however be trimmed at a height of between 5 and 10 cm above ground level, such that vegetation can regrow, but not so rapidly that firebreak maintenance becomes overwhelming.
- Inspect the firebreaks in June to assess the degree of restriction of vehicle access. If reserve fire vehicle access to any portion of the firebreaks becomes unduly restricted by vegetation regrowth, this portion of the firebreak must be recut within one week.

During preparation for prescribed ecological burns, temporary firebreaks must be cut in the same manner as the permanent firebreaks, no more than two months before the intended date of burn. They should lie along the burn block boundary and be of 8 to 10 m width and a final cut should be undertaken no more than two weeks before the burn. The temporary firebreaks should not be maintained or recut after the burn is complete until the next prescribed burn.

Vehicles must be restricted to reserve roads and firebreaks during ecological burns and wildfires, except in instances where infrastructure or lives are directly threatened to preserve veld integrity and limit soil compaction.

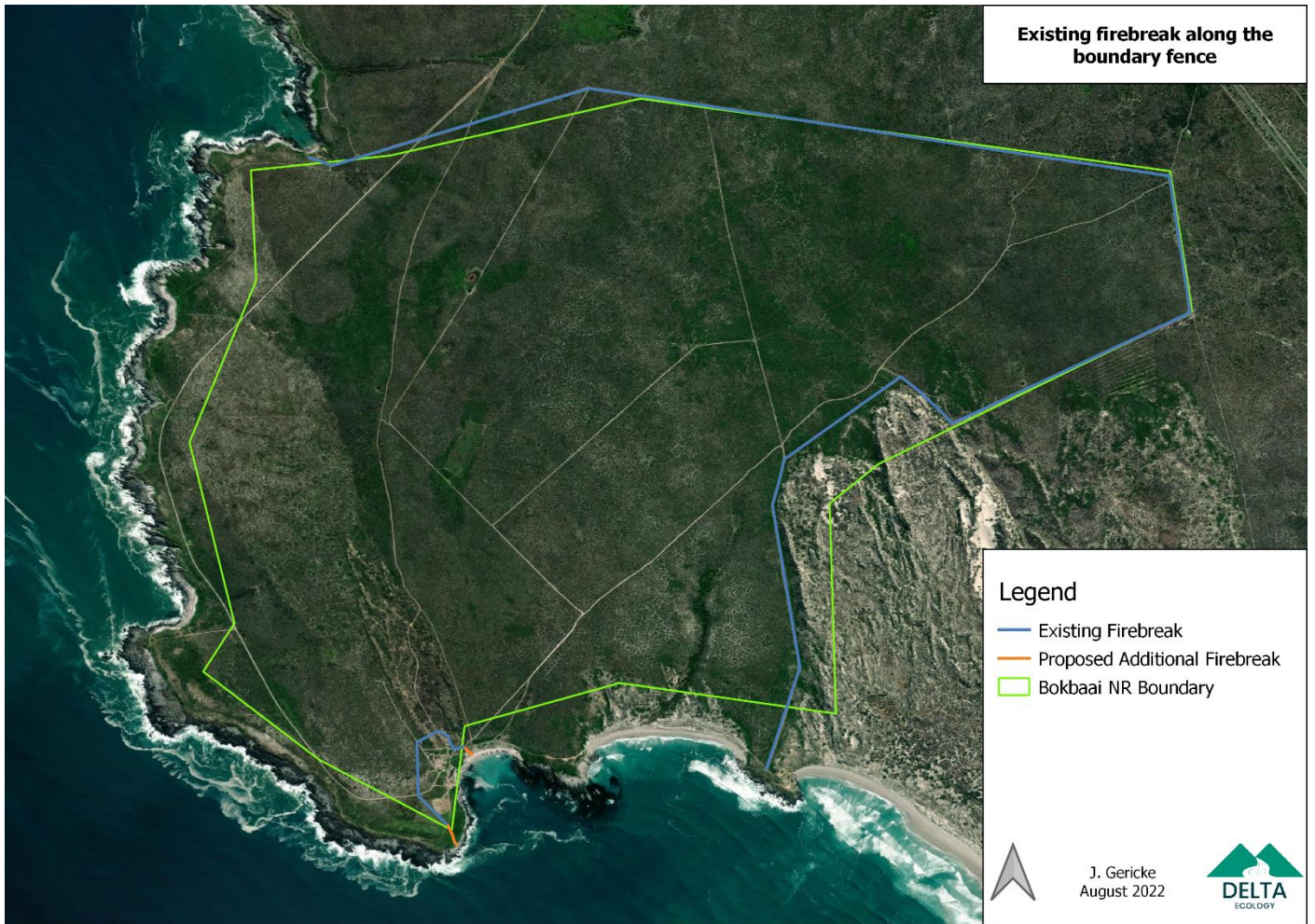
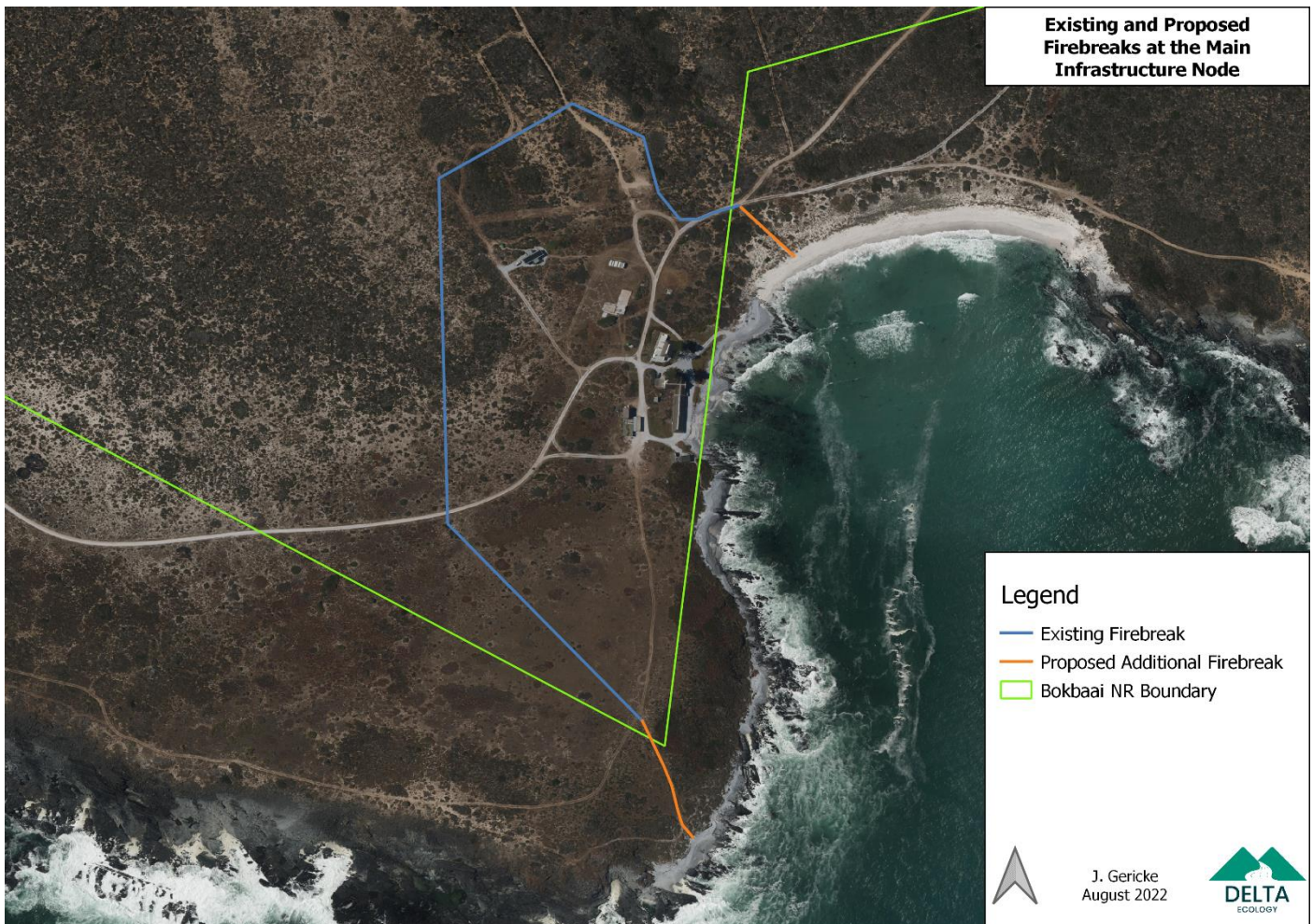


Figure 8-13: Existing and proposed firebreaks within the reserve.





**Figure 8-14: Existing and proposed firebreaks around the main infrastructure node.**

### 8.6.5.2 Equipment and Training

All field staff at the reserve must have at least basic wildfire training with one trained crew-leader on duty at all times to lead the team. The following personal firefighting equipment must be supplied to all trained field staff. It must be kept either with the staff member or at the nature reserve and must be maintained in a serviceable condition at all times.

- A set of fire-retardant overalls designed for wildfire fighting.
- A Nomex fire-retardant flash hood.
- A pair of fire-rated goggles (ensure that the goggles fit the face-hole in the flash hood such that no skin is exposed).
- A pair of calf-length fire-boots (to prevent burns when stepping mole-holes).
- A pair of leather or fire-retardant gloves.
- A water bottle or bladder carrying at least 2l of water.
- A backpack to carry the water bottle/bladder while on fire line and to store the remainder of the fire equipment in one place when not in use.

The following non-personal firefighting equipment must also be kept in a single, designated fire store area (apart from the vehicles that may be kept in a designated vehicle area on the reserve).

- At least two serviceable 4x4 vehicles.
- At least two 'skid unit/bakkie sakkie' and/or trailer mounted fire units that fit the available vehicles and carry at least 500l of water each.
- At least 20l of spare fuel for each unit.
- A fire hose for filling water tanks.
- At least one of each of the following hand-tools per trained field staff member:
  - Fire beater
  - Fire rake-hoe
  - Spade or shovel
- At least one of each of the following items:
  - Backpack sprayer (dedicated for firefighting use, not previously used for herbicide/pesticide or other use)
  - Pitchfork
- A comprehensive first aid kit that includes at least three large 'Burnshield' or similar dressings.

It is essential that firefighting equipment be maintained in a serviceable condition at all times, but particularly during the summertime fire season. The following maintenance measures should be implemented.

- Compile a list of all personal and general firefighting equipment to be inspected for serviceability. Test all equipment thoroughly.
- Use the checklist to inspect all firefighting equipment in September each, just prior to fire season.
- Reinspect all equipment in January of each year in the middle of fire season.
- Replace or repair any worn, rusted, damaged or unserviceable equipment as soon as it is detected, whether during an inspection or at any other time.

The key tasks to maintain fire preparedness are summarised below in **Table 8-11**.

**Table 8-14: Summary of Firefighting Preparedness Tasks**

Management activity	Time frame
Maintain Greater Cederberg Fire Protection Association Membership.	Ongoing
Maintain adequate firebreaks for wildfire access and protection and create adequate temporary firebreaks for ecological burns.	Ongoing
Capacitate field staff for wildfire response by providing and maintaining adequate equipment and training.	Year 1-2, ongoing maintenance

## 9. Implementing the Strategic Management Plan

### 9.1 Five-year Costing Plan

Below is an estimated breakdown of management costs for each management objective over a five-year period of this Strategic Management Plan (Table 9-1). The figures listed below are realistic in-terms of the Management Authorities forecasted budget at the time of drafting this plan. The detailed budgets in successive Annual Plans of Operation should be used to update this cost estimate on an annual basis.

**Table 9-1 Estimated annual management cost breakdown for a five-year period.**

Management objectives	2022	2023	2024	2025	2026
Biodiversity Knowledge Management	R500	R0,00	R0,00	R0,00	R0,00
Research and Field Surveys	R5 000	R210 000	R120 000	R120 000	R150 000
Biomonitoring	R5 000	R0,00	R0,00	R0,00	R0,00
Vegetation Management	R620 000	R620 000	R620 000	R620 000	R620 000
Aquatic and riparian systems	R0,00	R0,00	R0,00	R0,00	R0,00
Wildlife	R500 000	R630 000	R665 000	R208 000	R60 000
Species of Special Concern	Included in Research and Biomonitoring sections				
Rehabilitation and Restoration	R10 000	R25 000	R2000	R0,00	R35 000
Environmental Education	R10 000	R20 000	R0,00	R0,00	R0,00
Socio-economic development initiatives	R0,00	R0,00	R0,00	R0,00	R0,00
Heritage Features	R0,00	R0,00	R0,00	R0,00	R0,00
Legal Compliance	R0,00	R0,00	R0,00	R0,00	R0,00
Infrastructure and equipment	R320 000	R300 000	R300 000	R80 000	R0,00
Financial Management	R0,00	R0,00	R0,00	R0,00	R0,00
Signage, Access control and security	R10 000	R10 000	R13 500	R10 000	R10 000
Firefighting	R10 000	R10 000	R13 500	R10 000	R10 000
Auditing	R0,00	R0,00	R0,00	R0,00	R80 000
<b>Estimated Annual Management Cost:</b>	<b>R0,00</b>	<b>R0,00</b>	<b>R0,00</b>	<b>R0,00</b>	<b>R0,00</b>

## **9.2 Planning, Reporting and Revision**

### **9.2.1 Annual Report**

The Mapula Trust will draft a brief annual report at the end of each calendar year indicating all progress made in achieving the management goals. The report should highlight successes but should also note any planned management actions that were not undertaken, along with factors that contributed to or prevented success in each planned task. Tasks that are no longer relevant or where alternatives have been noted that may result in a better outcome, these must also be noted. The report will be submitted to CapeNature by the end of January. The first report should be submitted in January 2024 after the first full calendar year of implementation of the management plan.

### **9.2.2 Management Plan Updates**

Mapula Trust will have the option of updating this management plan with minor changes once per annum. The proposed changes and the reasoning behind them must be detailed in the annual report. The pre-existing plan and the updated plan must both accompany the annual report. The proposed changes will take effect if approved by CapeNature. CapeNature will have three weeks from the date of submission to review and approve or reject the proposed changes.

### **9.2.3 Annual Plan of Operation**

The Mapula Trust shall update the annual plan of operation to account for tasks completed in the past year, re-evaluation of costs and timelines, and for changes in the management plan approved by CapeNature. If no management plan changes are proposed in a particular year, the updated APO will be submitted to CapeNature along with the annual report before the end of the following January. If changes are proposed, the updated APO will be submitted by the end of February allowing time to update the APO after proposed changes have been approved or rejected by CapeNature.

### **9.2.4 Five-yearly Management Audit**

Management of Bokbaai NR will be audited against the existing management plan once in five years by an independent conservation management specialist OR by Mapula Trust management in collaboration with CapeNature specialists who are capable of assessing vegetation condition and fire readiness and have extensive conservation management knowledge and experience. The audit should be undertaken prior to and include recommendations for updating the plan, if required.



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# Appendices

## **APPENDIX A – List of statutes to which the Nature Reserve is subject**

Biodiversity and Cultural Resource Management and Development:

- Animals Protection Act [No. 71 of 1962]
- Conservation of Agricultural Resources Act [No. 43 of 1983]
- Constitution of the Republic of South Africa [No. 108 of 1996]
- Hazardous Substances Act [No. 15 of 1973]
- Western Cape Heritage Management Act [No. 10 of 1997]
- Western Cape Nature Conservation Management Act [No. 9 of 1997]
- Western Cape Biodiversity Act [6 of 2021]
- National Environmental Management Act [No. 107 of 1998]
- National Environmental Management: Biodiversity Act [No. 10 of 2004]
- National Environmental Management: Protected Areas Act [No. 57 of 2003]
- National Forests Act [No. 84 of 1998]
- National Heritage Resources Act [No. 25 of 1999]
- National Water Act [No. 36 of 1998]
- National Water Amendment Act [No. 45 of 1999]
- National Veld and Forest Fire Act [No 101 of 1998]
- Nature Conservation Ordinance [No. 19 of 1974]

General Management:

- Occupational Health and Safety Act [No. 85 of 1993]
- Western Cape Planning and Development Act [No. 7 of 1998]
- Local Government: Municipal Systems Act [No. 32 of 2000]

Human Resource Management:

- Basic Conditions of Employment Act [No. 75 of 1997]

# APPENDIX B - Copy of Bokbaai Nature Reserve and Heritage declarations

Western Cape Government • Wes-Kaapse Regering

PROVINCE OF WESTERN CAPE

PROVINSIE WES-KAAP

## Provincial Gazette

## Provinsiale Koerant

8070

8070

Friday, 29 March 2019

Vrydag, 29 Maart 2019

Registered at the Post Office as a Newspaper

As 'n Nuusblad by die Poskantoor Geregistreer

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(\*Herdrukke is verkrygbaar by Kamer M12, Provinsiale Wetgewing-gebou, Waalstraat 7, Kaapstad 8001.)

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PROVINCIAL NOTICE

P.N. 39/2019

29 March 2019

DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND DEVELOPMENT PLANNING

NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT, 2003 (ACT 57 OF 2003)

DECLARATION OF BOKBAAI NATURE RESERVE

I, Anton Bredell, Provincial Minister of Local Government, Environmental Affairs and Development Planning in the Western Cape, under Section 23(1)(a)(i) of the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003), declare a nature reserve on:—

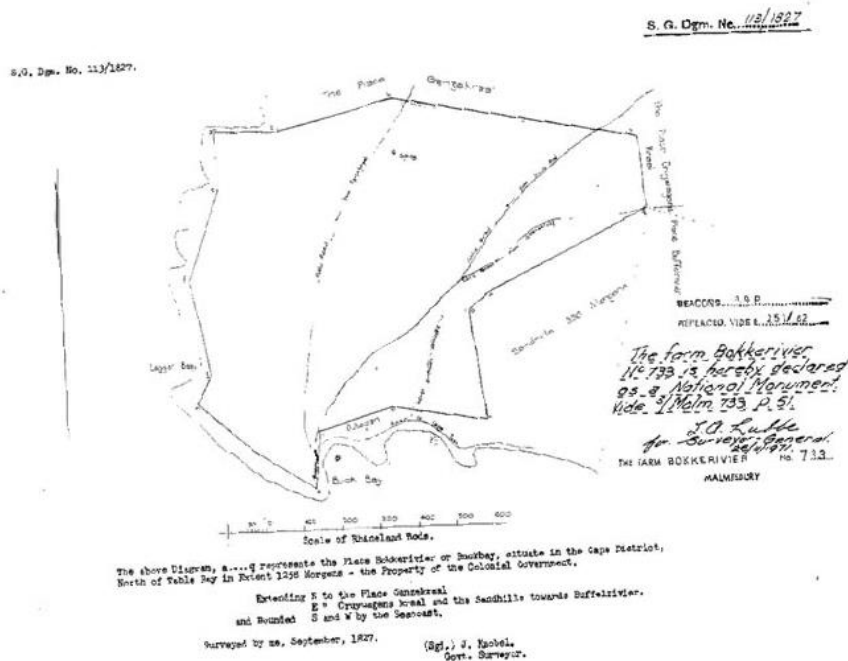
- The Farm Bokkerivier No. 733, in the Swartland Municipality, Division of Malmesbury, Western Cape Province; In extent: 1077,5173 (One Thousand and Seventy-Seven comma Five One Seven Three) hectares; Held by Deed of Transfer No. T24425/2015.

I assign the name "Bokbaai Nature Reserve" to the reserve, of which the boundaries are reflected on Surveyor-General Diagram No. 113/1827, as set out in the Schedule.

Signed at Cape Town this 26th day of March 2019.

MR AW BREDELL  
PROVINCIAL MINISTER OF LOCAL GOVERNMENT, ENVIRONMENTAL AFFAIRS AND DEVELOPMENT PLANNING

SCHEDULE



Copied from the diagram relating to  
Title Deed No. T. 24425/15  
dated 25th November, 2015 in favour of  
Lorraine Johannes by Joseph A. Kroll  
30 JUL '15  
S.G. GENERAL  
CAPE TOWN.

Sheet 28 of 28

C  
S  
N.R.

PROVINSIALE KENNISGEWING

P.K. 39/2019

29 Maart 2019

DEPARTEMENT VAN OMGEWINGSAKE EN ONTWIKKELINGSBEPLANNING

“NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT, 2003” (WET 57 VAN 2003)

VERKLARING VAN BOKBAAI NATUURRESERVAAT

Ek, Anton Bredell, Provinsiale Minister van Plaaslike Regering, Omgewingsake en Ontwikkelingsbeplanning in die Wes-Kaap, kragtens Artikel 23(1)(a)(i) van die “National Environmental Management: Protected Areas Act, 2003” (Wet 57 van 2003), verklaar ’n natuurresewaat op:—

- Die Plaas Bokkerivier Nr. 733, geleë in die Swartland Munisipaliteit, Afdeling Malmesbury, Provinsie Wes-Kaap; Groot: 1077,5173 (Een Duisend Sewe en Sewentig komma Vyf Een Sewe Drie) hektaar; Gehou kragtens Transportakte Nr. T24425/2015.

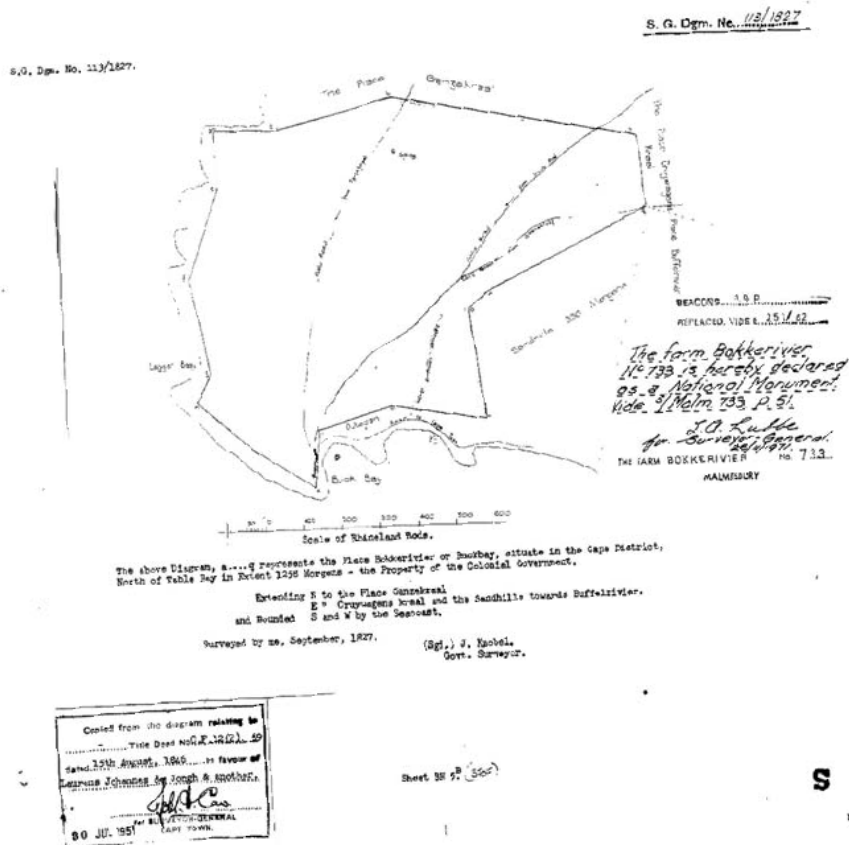
Ek ken die naam “Bokbaai Natuurresewaat” toe aan die resewaat, waarvan die grense weergegee word op die Landmeter-generaaldigram Nr. 113/1827, soos uiteengesit in die Bylae.

Geteken te Kaapstad op hede die 26ste dag van Maart 2019.

MNR AW BREDELL

PROVINSIALE MINISTER VAN PLAASLIKE REGERING, OMGEWINGSAKE EN ONTWIKKELINGSBEPLANNING

BYLAE



ISAZISO SEPHONDO

I.S. 39/2019

29 kweyoKwindla 2019

ISEBE LEMICIMBI YOKUSINGQONGILEYO NOCWANGCISO LOPHUHLISO

UMTHETHO OYINATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT, 2003 (UMTHETHO 57 KA-2003):

ISIBHENGEZO SENDAWO YOLONDOLOZO LWENDALO YASEBOKBAAI

Mna, Anton Bredell, uMphathiswa wePhondo wooRhulumente beNdawo, iMicimbi yokuSingqongileyo noCwangciso loPhuhliso eNtshona Koloni, ngaphantsi kwecandelo 23(1)(a)(i) loMthetho oyiNational Environmental Management: Protected Areas Act, 2003 (uMthetho 57 ka-2003), ndibhengeze ulondolozo lwendalo kwi:—

- Fama iBokkervier enguNombolo 733, ekuMasipala waseSwartland, iCandelo laseMalmesbury, kwiPhondo laseNtshona Koloni; Iihektare eziye-1077,5173 (Iwaka elinamaShumi aSixhenxe aneSixhenxe khoma isiHlanu isiNye isiThathu); Ephantsi kweNombolo yoNikezelo loMhlaba engu-T24425/2015.

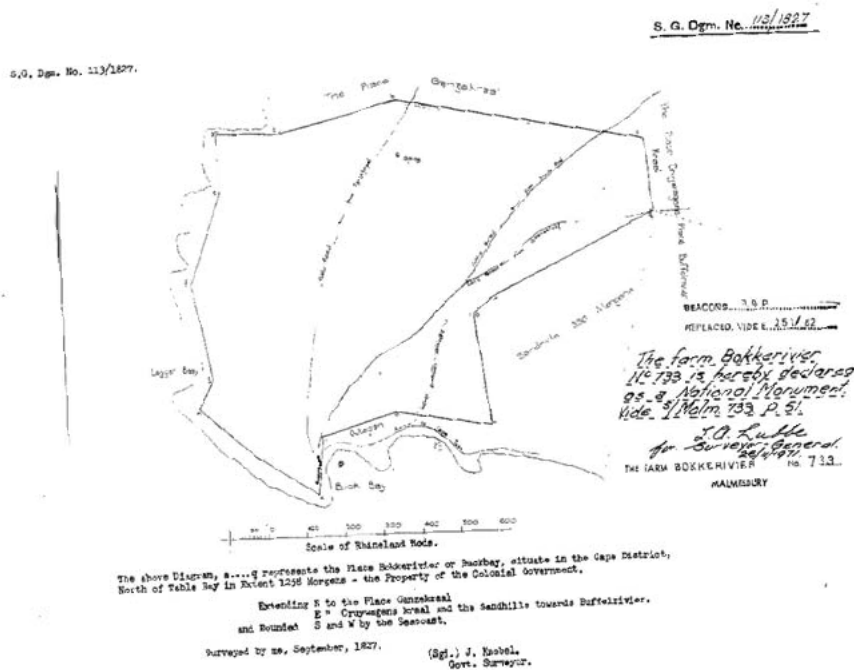
Ndinikezela ngegama elithi “INDawo yoLondolozo lweNdalo yaseBokbaai” kule ndawo yolondolozo, enemida eboniswe kwiDayagram kaNocanda-Jikelele enguNombolo 113/1827, njengoko kubonisiwe kwiShedyuli.

Isayinwe eKapa ngalo mhla kwinyanga 26 kweyoKwindla 2019.

A BREDELL

UMPHATHISWA WEPHONDO WOORHULUMENTE BEDAWO, IMICIMBI YOKUSINGQONGILEYO NOPHUHLISO

ISHEDYULI



Copied from the diagram relating to  
 Title Deed No. 113/1827, 29  
 dated 25th August, 1965, in favour of  
 Lawrence Johannes de Jongh & another.  
 30 JUL 1961  
 THE REGISTRAR  
 CAPETOWN.

Sheet No. 1 (56)

C  
S  
K.R.

DECLARATION OF A NATIONAL MONUMENT

Under section 10 (1) of the National Monuments Act, 1969 (Act 28 of 1969), I, Johannes Petrus van der Spuy, Minister of National Education, hereby declare the farm called Bokke Rivier, in the Division of Malmesbury, to be a national monument.

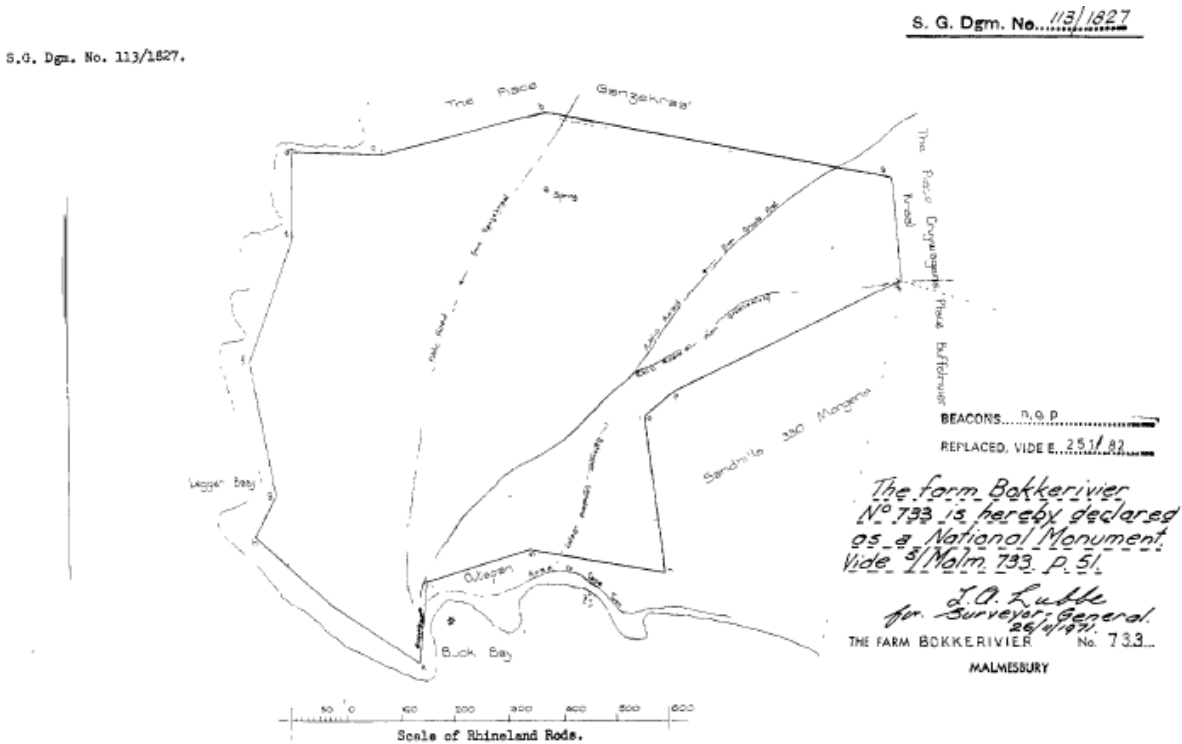
Description

Certain piece of freehold land, called Bokke Rivier or Buck Bay, situate north of Table Bay, in the Division of Malmesbury (now described as the farm Bokkerivier 733), measuring 1258 morgen and held under paragraph 1 of Deed of Transfer 25189, dated 4 November 1968.

Scientific aim Historical Interest

The farm Bokke Rivier is world renowned for the "Bokbaai vygies", nemesias and the wealth of other flowers and wild life that flourish there, The farm buildings of Buck Bay are of outstanding historical and aesthetic value,

J. P. VAN DER SPUY, Minister of National Education.



The above Diagram, a...q represents the Place Bokkerivier or Buckbay, situate in the Cape District, North of Table Bay in Extent 1258 Morgens - the Property of the Colonial Government.

Extending N to the Place Gensekraal  
E " Cruywagens Kraal and the Sandhills towards Buffelrivier.  
and Bounded S and W by the Seacoast.

Surveyed by me, September, 1827.

(Sgd.) J. Knobel.  
Govt. Surveyor.

Copied from the diagram relating to  
Title Deed No. F. 1216... 59  
dated 15th August, 1846... in favour of  
Laurens Johannes de Jongh & another.  
80 JUL 1951  
for SURVEYOR GENERAL  
CAPE TOWN.

Sheet BH 5<sup>B</sup> (Stop)

C  
S  
H.R.

APPENDIX C - Zonation Categories





**Table C1: Zonation of Primitive Areas**

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

**Table C2: Zonation of Nature Access Areas**

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

**Table C3: Zonation of Development – Low Intensity**

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

## APPENDIX D - Annual Plan of Operation 2023

This plan provides detailed, budget-aligned management actions for period January to December 2023. Additional management actions for future years and that may be ongoing across a number of years are also included for future reference, but those not applicable to 2023 are in grey.

**Table D1: KPA 1 - Biodiversity and Ecological Components**

1.1 Biodiversity Knowledge Management and Sharing						
<p><u>Objective Statement:</u> To gather, document and share knowledge on how to achieve management objectives with the reserve team to increase management effectiveness, and with the broader conservation community.</p>		<p><u>Deliverables:</u></p> <ul style="list-style-type: none"> <li>Prioritised list of key knowledge gaps to be researched.</li> <li>Partnerships with academic institutions are formed to close knowledge gaps in a prioritised manner but making use of opportunities as available.</li> <li>Up-to-date electronic repository for all research conducted at or relevant to Bokbaai NR, accessible for / sharable with academic partner organisations. Ensure that all researchers working on-site provide electronic copies of their reports to the reserve for uploading.</li> <li>Management plan reflects latest research during reviews.</li> <li>Field staff are aware of any significant research that may impact their reserve management tasks.</li> </ul>				
MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
Draft and maintain a list of research priorities and make it available to partner institutions.	Year 1-2, ongoing maintenance of the list	Mapula Trust	Initial list included in this plan.	Update list as priorities change and make list available to academic partner organisations.	Prioritised, up-to-date research list available to partner organisations.	None – only requires existing staff time.
Establish and maintain partnerships with academic institutions	Year 1, ongoing	Mapula Trust	Initial Planning Phase	Approach academic institutions and similar organisations to assist with research.	Partnerships result in regular progress with listed research/survey priorities.	None – only requires existing staff time.
Create and maintain an electronic repository for all research conducted at or relevant to Bokbaai NR.	Year 1-3, ongoing	Mapula Trust	Pending	Initiate use of Biodiversity Database or alternative repository. Ensure that all researchers working on site provide electronic copies of their reports to	Online sharable repository identified, used and up-to-date.	None – only requires existing staff time.



				the reserve to add to the online repository.		
Ensure that the management plan is updated in accordance with the latest research during reviews.	Year 5	Mapula Trust and appointed reviewer	Pending	Ensure that latest research is incorporated into 5-yearly management plan update	Management plan is based on latest research.	None – included in review cost. See management plan review section.
Alert field staff to any significant research outcomes that may change any element of reserve management.	Ongoing	Mapula Trust	Ongoing	Inform field staff if significant research is noted that pertains to their duties.	Field staff are aware of new research and implications for their tasks.	None – only requires existing staff time.

## 1.2 Research and Field Surveys

MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
<p><u>Objective Statement:</u> To continually increase the level of understanding of the ecosystems present within Bokbaai NR, such that management of these ecosystems may continually improve.</p>		<p><u>Deliverables:</u></p> <ul style="list-style-type: none"> <li>Establish relationships with key research partners.</li> <li>Survey and map all SCC plant species as a baseline for monitoring.</li> <li>Flesh out all species lists.</li> <li>Ensure that management of Bokbaai NR is in line with latest research and continually improves as new research is conducted.</li> </ul>				
Formally identify <i>Psoralea cf glaucena</i> to inform further management actions.	Year 1 – September/October	Field staff, appointed specialist or CREW – arranged by Mapula Trust	Pending	Take sample to SANBI and pay for formal identification	<i>Psoralea cf glaucena</i> is formally identified.	Approx R500 (petrol and identification fees)
Determine baseline distribution and population of <i>Psoralea cf glaucena</i> .	Year 1 or 2	Field staff, appointed specialist or CREW – arranged by Mapula Trust	Pending	Survey wetlands and map location of each plant/patch.	Distribution is mapped and number of individuals/patches is known.	None – if undertaken by staff or CREW volunteers.
Determine presence of additional botanical SCC and improve general species list.	Year 1 or 2	Mapula Trust and CREW or academic partner organisation	Pending	Arrange a “bioblitz” with CREW or a similar organisation focussed on SCC, but noting other species as well.	Reserve is adequately surveyed to determine whether additional SCC species may be present.	None – will incur existing staff time.

Determine presence of <i>Lepidoptera</i> SCC and improve general species list.	Year 2-4	Mapula trust and academic partner organisations OR appointed specialist	Pending	Arrange baseline <i>Lepidoptera</i> survey by sweep netting during early summer (October / November).	<i>Lepidoptera</i> SCC have been surveyed and identified with a high degree of confidence. <i>Lepidoptera</i> general species list is improved.	None if undertaken by academic partner organisation. Approx. R60k if by consultant.
Determine presence of <i>Scarabacae</i> SCC and improve general invertebrate species list.	Year 2-4	Mapula trust and academic partner organisations OR appointed specialist	Pending	Arrange baseline <i>Scarabacae</i> survey by pitfall trap and active capture.	<i>Scarabacae</i> SCC have been surveyed and identified with a high degree of confidence. <i>Invertebrate</i> general species list is improved.	None if undertaken by academic partner organisation. Approx. R150k if by consultant.
Determine presence of mammalian SCC and improve general small mammal species list.	Year 3-6	Mapula trust and academic partner organisations OR appointed specialist	Pending	Arrange baseline potential SCC-focussed small mammal survey by Sherman trap array.  Arrange baseline mammal SCC-focussed camera trap survey.	Mammal SCC have been surveyed and identified with a high degree of confidence. Mammal general species list is improved.	None if undertaken by academic partner organisation. Approx. R60k if by consultant.

Determine whether fish SCC reside in the Bok River.	Year 3-6	Mapula trust and academic partner organisations OR appointed specialist	Pending	Arrange Bok River fish survey by eDNA.	Bok River fish species have been identified, including SCC.	Approximately R6000 for a single sample
Determine presence and degree of dependence of avifaunal SCC on the Bokbaai NR and improve general avifaunal species list	Year 4-8	Mapula trust and academic partner organisations OR appointed specialist	Pending	Arrange avifaunal baseline surveys in four seasons.	SCC list is updated with high degree of confidence. SCC that breed within or are otherwise dependent on the reserve are noted with management guidelines given. General species list is updated.	None if undertaken by academic partner organisation. Approx. R120k if by consultant.
Determine presence of possible <i>Scelotes</i> SCC.	Year 3-6	Mapula trust and academic partner organisations OR appointed specialist	Pending	Arrange <i>Scelotes</i> active search survey.	<i>Scelotes</i> SCC have been confirmed present or absent with a high degree of confidence.	None if undertaken by academic partner organisation. Approx. R50k if by consultant.
Confirm presence of herpetofaunal SCC and improve general herpetofaunal species list	Year 5-10	Mapula trust and academic partner organisations OR appointed specialist	Pending	Arrange herpetofaunal baseline survey by funnel and pitfall trap arrays with drift fencing.	Potential herpetofaunal SCC species have been confirmed present or absent with a high degree of confidence.	None if undertaken by academic partner organisation. Approx. R150k



						if by consultant.
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## 1.3 Biomonitoring

<p><u>Objective Statement:</u> To provide a quantitative measure of change in the reserve ecosystems over long periods of time such that gradual changes can be managed accordingly.</p>	<p><u>Deliverables:</u></p> <ul style="list-style-type: none"> <li>Establish a protocol for recording ad-hoc sightings of fauna, flora and ecologically relevant events.</li> <li>Monitor hydrology, vegetation condition and SCC presence and populations by appropriate means.</li> <li>Ensure that monitoring priorities and protocols are practically implementable by existing field staff with limited additional training, equipment and distraction from present duties.</li> <li>Capacitate field staff to undertake monitoring tasks by providing required equipment and training.</li> <li>Ensure that all biomonitoring data generated is stored in a useful, accessible format.</li> </ul>
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MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
Capacitate field staff to log ad-hoc sightings and events of ecological importance on the Biodiversity Database ( <a href="http://www.biodiversity.co.za">www.biodiversity.co.za</a> )	Year 1, ongoing	Mapula Trust	Pending	Provide computer, arrange user profiles and training (with the City of Cape Town). Instruct field staff to begin using the database.	Field staff log all ad-hoc sightings of interest, and all ecologically important events such as illegal harvesting incidents or wildfires.	None (computer cost is included under equipment)
Monitor rainfall and aquifer water level.	Year 1, ongoing	Mapula Trust	Pending	Install rain gauge at the main infrastructure node and water level measuring rod at the dam. Begin weekly rainfall and monthly dam water level monitoring.	Record changes in rainfall and aquifer water level such that the two datasets can be correlated to confirm climate change as the cause of the drying wetlands.	R 1 000 for rain gauge and measuring rod materials, plus existing field staff time.
Monitor vegetation changes over time using fixed-point photography.	Setup in year 1.  Quarterly monitoring during year 1, year 4, year 7, year 10, and	Mapula Trust	Pending	Install fixed point photography bases and take baseline photographs in each season.	Continuous photographic dataset from which changes in vegetation condition including thicket encroachment, senescence, alien vegetation establishment, fire, desiccation, species	Materials for bases approx. R4000  No camera purchase required – may be undertaken with any

	each third year thereafter				assemblages may be assessed.	standard camera including smartphone cameras.
Monitor indicator bird species by strip count.	Year 1, ongoing, monthly	Mapula Trust and reserve field staff	Pending	Capacitate staff by providing binoculars, bird books and an indication of the route to be driven. Initiate monitoring of the two indicator species.	Strip count data is consistently produced and uploaded to the online repository for assessment during management plan reviews.	None – bird books are available. Binocular cost is included under equipment.
Monitor EN and CR plant populations.	Annually from year 2	Mapula Trust and reserve field staff	Pending	Count all plants/clumps of each CR and EN plant species once per year.	Population data is recorded and uploaded annually to the online data repository.	None – undertaken by field staff.

# 1.4 Vegetation Management

<p><u>Objective Statement:</u> To conserve the Fynbos and Strandveld mosaics typical of the vegetation types, ensure effective conservation of the floral biodiversity and improve the ecosystem functioning in Bokbaai NR.</p>	<p><u>Deliverables:</u></p> <ul style="list-style-type: none"> <li>· Map distributions of plant SCC present on the reserve, with population counts/estimates.</li> <li>· Establish a comprehensive floral species list available for research, management and environmental education.</li> <li>· Re-establish a near-natural fire regime appropriate for each vegetation type.</li> <li>· Use large game animals to help maintain the veld mosaic.</li> <li>· Undertake active and passive rehabilitation as per the ‘restoration and rehabilitation’ section below.</li> <li>· Establish an alien invasive flora eradication programme focussed on weedy alien species currently present within the reserve.</li> <li>· Ensure that new alien invasive species within the reserve are noted and addressed appropriately as they emerge.</li> <li>· Implement a veld monitoring programme that provides indications of bush encroachment, readiness for fire, presence and density of alien invasive species and change in SCC numbers and, where relevant, distribution.</li> </ul>
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MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
Reintroduce large game animals to reduce thicket encroachment and promote habitat diversity.	Year 2-4	Mapula Trust	Pending	Initiate stocking	Completed vegetation assessment with fine scale, up to date vegetation map, plant species list (Incl. SCC) and management recommendations.	Included under Wildlife section below.
Inspections and maintenance clearing in blocks with low woody alien density – blocks 1 to 6, 8 and 11.	Annually from year 1	Bokbaai NR field staff	Pending	Inspect each block systematically by road and on foot. Clear all woody aliens encountered by methods appropriate to their size class.	Listed blocks remain in maintenance phase	Tools included under equipment section below.  Herbicide and consumables cost approx. R500/annum.



<p>Inspections and follow-up clearing of blocks with densely invaded areas – blocks 7, 9, 10 and 12.</p>	<p>Quarterly from year 1, until maintenance phase is achieved (after two consecutive quarterly inspections fail to locate woody aliens – blocks may move to maintenance phase individually)</p>	<p>Bokbaai NR field staff</p>	<p>Pending</p>	<p>Inspect each block systematically by road and on foot. Clear all woody aliens encountered by methods appropriate to their size class.</p>	<p>Listed blocks reach maintenance phase in under 5 years</p>	<p>Tools included under equipment section below. Herbicide and consumables cost approx. R4500/annum.</p>
<p>Monitor recovery of woody alien species post fire and clear as necessary.</p>	<p>Ad-hoc after ecological burns or wildfires. Requires at least 8 months to reach maintenance phase</p>	<p>Bokbaai NR field staff</p>	<p>Pending</p>	<p>Inspect/clear monthly until no seedlings are noted for two consecutive months, then quarterly until no seedlings are noted for two consecutive quarters, then annually.</p>	<p>Burnt blocks regain maintenance phase within two years post fire</p>	<p>Tools included under equipment section below. Herbicide and consumables cost approx. R5000/annum.</p>
<p>Phase out non-indigenous shade/windbreak trees.</p>	<p>Year 1 to 10</p>	<p>Bokbaai NR field staff</p>	<p>Pending</p>	<p>Plant indigenous, non-invasive windbreak/shade species in strategic locations to replace alien species at the camp site and at the dam. Remove alien trees when function is filled by indigenous species.</p>	<p>Alien shade/windbreak trees are replaced with indigenous trees within 10 years</p>	<p>Approximately 20 trees required – approx. R 10 000 for trees, transport and compost for planting.</p>

Re-establish near-natural fire regime.	Year 1 – ongoing (undertake burns between December and March)	Mapula Trust	Pending	Plan and execute ecological burns in accordance with the schedule provided. Ecological burn planning and operations must be overseen by a qualified Fire Incident Commander (grade five or greater). Open burning permit must be secured from the applicable municipality. Initiate the process by burning blocks 12, 10 and 7 in the first 12 months.	Fire regime supports maximum biodiversity	Approximately R600 000 per annum (to burn 3 blocks)
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## 1.5 Aquatic and Riparian Systems

<p><u>Objective Statement:</u> To ensure effective conservation of aquatic and riparian systems and improve the biodiversity and ecosystem function of aquatic and riparian systems on the reserve.</p>	<p><u>Deliverables:</u></p> <ul style="list-style-type: none"> <li>· Implement a monitoring programme that provides indications of hydrological supply changes in the aquatic systems of the reserve.</li> <li>· Survey the Bok River for <i>Galaxius</i> fish species by means of an eDNA sample.</li> <li>· Implement an alien invasive species clearing and maintenance programme for all aquatic systems and their catchments, particularly the Bok River and the wetlands that contain <i>Psoralea cf glaucena</i>.</li> <li>· Include wetland systems in the prescribed ecological burn programme.</li> <li>· Re-establish natural disturbance through introduction of indigenous large herbivores.</li> <li>· Control <i>Typha capensis</i> in the dam.</li> </ul>					
MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
<p>These deliverables are addressed by the measures included in the Biomonitoring, Vegetation Management, Wildlife and Rehabilitation sections. No additional actions are required.</p>						

## 1.6 Wildlife

<p><u>Objective Statement:</u> To ensure effective conservation of faunal species, populations, and inter-relationships to enhance biodiversity and maintain and improve ecosystem functioning.</p>	<p><u>Deliverables:</u></p> <ul style="list-style-type: none"> <li>• Reintroduce appropriate large herbivores and manage their populations at viable carrying capacity.</li> <li>• Conduct surveys to determine presence of SCC fauna species in a prioritised manner and establish monitoring programmes to determine continued presence.</li> <li>• Compile and maintain a complete fauna species list covering mammals, amphibians, reptiles, birds and invertebrates, using ad-hoc and survey-related records.</li> <li>• Remove alien European honeybee hives OR establish a research programme to determine impact of the hives on native fauna and flora, including native bees.</li> <li>• Ensure that other potentially invasive fauna species do not become established in the reserve.</li> </ul>
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MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
Ensure adequate fencing is in place to enclose large game.	Year 1 - 3	Mapula Trust in collaboration with CapeNature	Pending	Address fencing with CapeNature to determine whether Ganzekraal Reserve fencing may be completed/upgraded or whether Bokbaai NR will require perimeter game fencing. Install fencing if required.	Game fencing is adequate to enclose large herbivores.	None – if Ganzekraal fencing is completed / upgraded by CapeNature.  Alternatively, approx. R1.5m will be required to install a game fence on the Bokbaai NR boundary, with a budget of R5000/annum to maintain.
Introduce approximately 13 or 14 eland to Bokbaai NR.	Year 2-4	Mapula Trust	Pending	Acquire translocation permit from CapeNature.  Capture eland at Elandsberg NR and release at Bokbaai NR.  Manage population such that 20 to 50 % thicket cover remains.	Breeding herd of eland introduced to Bokbaai NR.  Population	Capture and transport cost (assuming helicopter boma capture method): Approx. R 200 000



Introduce approximately 10 red hartebeest to Bokbaai NR.	Year 4 - 6	Mapula Trust	Pending	Acquire translocation permit from CapeNature. Source red hartebeest from a Western Cape reserve or farm and release at Bokbaai NR. Manage population such that 20 to 50 % thicket cover remains.	Breeding herd of red hartebeest introduced to Bokbaai NR. Population	Approx. R150 000 purchase and transport price for the animals
Ensure that the European honeybees kept at Bokbaai NR do not impact negatively on indigenous fauna or flora, especially indigenous bees.	Year 2-4	Mapula Trust and academic partner organisations.	Pending	Remove beehives <u>OR</u> initiate research on impacts with academic partner organisations.	Ecological impact from European honeybee is adequately managed in accordance with the precautionary principle.	None.

## 1.7 Species of Special Concern

<p><u>Objective Statement:</u> To ensure populations of species of special concern grow to meet natural population limits, whereafter populations are maintained.</p>	<p><u>Deliverables:</u></p> <ul style="list-style-type: none"> <li>· Identify plant and animal species of special concern present on the reserve by formal survey.</li> <li>· Establish and monitor distribution and population numbers of the identified floral species.</li> <li>· Establish and monitor presence of SCC fauna species.</li> <li>· Identify and implement special management requirements for each species if required.</li> </ul>					
MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
<p>These deliverables are addressed by the measures included in the Biomonitoring section. No additional actions are required.</p>						

## 1.8 Rehabilitation and Restoration

MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
<p><b>Objective Statement:</b> To ensure that all previously disturbed or transformed areas are rehabilitated, apart from those that are required for essential reserve activities and infrastructure required by this management plan.</p>		<p><b>Deliverables:</b> Remove unnecessary infrastructure and rehabilitate previously disturbed areas wherever possible within the reserve. Use active rehabilitation at the dam by addressing overgrowth of indigenous <i>T. capensis</i>. Implement long term monitoring of rehabilitation sites to determine effectiveness.</p>				
Close all non-essential roads/tracks and allow to rehabilitate. Close all roads/tracks to vehicle traffic that can be downgraded to trails and maintain only a walking track.	Year 1-2	Bokbaai NR field staff	Pending	Close roads by placing a physical barrier at access points and a sign indicating 'rehabilitation in progress' and 'road closed' or 'no vehicles'.	Unnecessary roads rehabilitate passively.	Cost for signage and materials for barriers: approx. R10 000.
Formalise parking bays at the two identified visitor parking sites, close unnecessary disturbance sites and initiate rehabilitations.	Year 3 - 4	Bokbaai NR Field Staff	Pending	Lay out, clear and demarcate parking bays adjacent to the road at the two parking areas. Close the remainder of the disturbed areas by installing a physical pole barrier. At the southern site, spread the soil from the mounds across the site by hand. Install "rehabilitation in progress" signs and allow to rehabilitate passively.	Formal parking bays, adequate to meet the demand, are provided at the two sites. The remainder of the previously disturbed area is closed off and rehabilitated.	Cost for pole barrier materials: approx. R2 000.
Control <i>Typha capensis</i> in the dam.	Year 1-2	Bokbaai NR Field Staff and contractors (if required)	Pending	Clear entire dam of <i>T. capensis</i> by digging out the roots by hand or by excavator. If an excavator is used, ensure that the excavator is confined to a single, previously disturbed entry path and to	Dam contains not more than 20% <i>T. capensis</i> cover at any time.	Will require additional labour or a contractor. Cost: approx. R 25 000.

				the dam itself. Repeat once cover exceeds 20%.		
Remove unused concrete reservoirs and allow passive rehabilitation to take place.	Year 5- 10	Bokbaai NR	Pending	Remove old concrete reservoirs by means of a digger-loader. Ensure that all concrete is removed. Rip the upper 30cm of any areas used by the digger loader to minimise compaction impacts. Monitor after disturbance as per post-fire monitoring.	Old concrete reservoirs have been removed and natural vegetation has re-established.	Approximately 10 days of digger-loader rental, with driver. Cost: approx. R35 000, including transport to site.



**Table D2: KPA 2 - Sustainable utilisation of Natural Resources**

2.1 Environmental Education						
<p><b>Objective Statement:</b> To provide students with an opportunity to learn about the natural environment and grow in a personal capacity.</p>		<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Complete construction of environmental education infrastructure as planned.</li> <li>Maintain relationships with partner organisations such that at least 500 children per year or more participate in environmental education programmes at the Bokbaai NR.</li> <li>Provide information on the reserve’s natural features and amenities to environmental educators at partner organisations such that full use is made of the opportunities available in the reserve.</li> <li>Ensure that environmental education infrastructure, activities and operations do not have a negative impact on any of the conservation objectives of the reserve.</li> <li>Ensure that environmental education infrastructure design and construction complies with development planning requirements.</li> <li>Develop trails, bird hides and other appropriate infrastructure to enhance environmental education opportunities.</li> <li>Erect signage at the main infrastructure node to educate fishermen about Bokbaai NR biodiversity, coastal biodiversity and conservation</li> </ul>				
MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
Ensure that the opportunities provided by the reserve are fully utilised for environmental education by providing information to partner organisations on the reserve features that may be of value in an environmental education programme and suggesting activities that take advantage thereof.	Year 1	Mapula Trust	Pending	Create a brochure / booklet that provides information on environmental education facilities and opportunities.	Environmental education partners make full use of the reserve features for environmental education.	Design and printing of brochure /booklet: Cost: approx. R10 000
Provide educational signage for fishermen and other ad-hoc visitors.	Year 2-3	Mapula Trust	Pending	Design and print signage for the main infrastructure node.	Fishermen become more environmentally aware.	Design and printing of signage: Approx. R20 000

**Table D3: KPA 3 - Socio-economic and heritage**

3.1 Socio-economic development initiatives						
<u>Objective Statement:</u> To work with relevant stakeholders to make a meaningful contribution towards the socio-economic development needs of local communities.	<u>Deliverables:</u> <ul style="list-style-type: none"> <li>· Where possible, select employees and service providers from communities near to the reserve.</li> <li>· Contribute to employment within the environmental education NGO sector by providing environmental education opportunities of a quality that will sustainably attract international funding for partner organisations.</li> </ul>					
MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
No specific management actions are advocated for promoting socio-economic development, beyond the normal operation of the reserve in accordance with the vision.						

## 3.2 Heritage features

<p><b>Objective Statement:</b> To locate, document, study and conserve archaeological, paleontological, and cultural heritage features on the reserve, while contributing to the body of knowledge on the subject and using the history of Bokbaai to educate youth on relevant heritage issues and their links to modern life in South Africa.</p>	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Partner with an academic institution to confirm the possible outspan identified.</li> <li>Where possible, support academic institutions in furthering the body of knowledge on Bokbaai’s heritage.</li> <li>Ensure that record of all heritage features are kept on site, including location and all significant information for use in education programmes and research.</li> <li>Conserve the integrity of all archaeological and heritage features on the reserve through adequate maintenance.</li> </ul>					
MANAGEMENT ACTIONS	Timeframe	Responsibility	Progress	Action required	Target	Budget
Ensure that heritage information and experiences are incorporated into environmental education information brochure/booklet for partners.	Year 1-2	Mapula Trust	Pending	Incorporate heritage features into the environmental education brochure / booklet.	Partner organisations make full use of heritage features for education programmes.	None
Verify possible outspan site.	Year 2 -4	Mapula Trust and academic partner institutions	Pending	Arrange for specialist to verify outspan location.	Possible outspan site verified and used for heritage education.	None if undertaken by partner institution

**Table D4: KPA 4 - Management Authority effectiveness and sustainability**

4.1 Legal Compliance						
<p><b>Objective Statement:</b> To ensure all reserve declaration documentation is in order and that all activities are compliant with relevant legislation and policies.</p>		<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Submit this plan to CapeNature for approval.</li> <li>Manage the reserve in compliance with the approved management plan.</li> <li>Train reserve staff on relevant legal obligations and potential pitfalls, and make sure instructions from Mapula Trust on legally complicated actions are clear.</li> <li>Ensure that no unlawful activities are undertaken by reserve staff or contractors.</li> </ul>				
MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
Ensure that security staff understand the nature and limitations of the landowners power of arrest, search and seizure delegated to them.	Year 1	Mapula Trust	Pending	Draft letter clarifying Mapula Trust's position on the application of Criminal Procedures and therefore the extent and limitations of powers delegated to security staff and the procedures required when exercising these powers.	Ensure that security staff are aware of the extent and limitations of their powers as dictated by Mapula Trust in terms of the Criminal Procedures Act.	None

## 4.2 Infrastructure and Equipment

MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
<p><b>Objective Statement:</b> To maintain infrastructure and equipment in a good state and to ensure that infrastructure and equipment are adequate to address the needs of field staff in implementing this plan.</p>	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Encourage and provide opportunity for reserve staff to raise infrastructure and equipment needs.</li> <li>Ensure that infrastructure is sufficient for operational requirements in accordance with the reserve objectives.</li> <li>Ensure that field staff have all equipment and resources required to implement this management plan.</li> <li>Maintain and service infrastructure and equipment such that it is kept in safe working order.</li> </ul>					
Provide adequate, permanent indoor and enclosed outdoor workshop and storage space for maintenance activities and other projects.	Year 1-4	Mapula Trust	Pending	Plan and construct a workshop adequate for reserve needs, including indoor workshop space, an indoor store and an outdoor, but enclosed work/storage yard. Ensure compliance with environmental regulations.	Workshop and storage space is sufficient to	Approx. R1 000 000
Maximise use of the dam for environmental education by constructing a bird hide.	Year 3-6	Mapula Trust and Bokbaai NR field staff	Pending	Plan and construct a bird hide at the dam adequate to hold a full environmental education camp of 40 children, plus environmental educators. Ensure compliance with environmental regulations.	Safe, functional bird hide is provided for environmental education	Timber and labour, Approx. R80 000
Provide a standardised infield mapping and navigation capacity for field staff.	Year 1	Mapula Trust and Bokbaai NR field staff	Pending	Select and install smartphone-based mapping application or provide GPS unit to field staff. Provide training and geographical data required to implement this management plan.	Field staff are able to view, create and share geographical information and navigate to reserve boundaries and points of interest.	R 4 000 or less. Many adequate smartphone mapping apps are free.



Provide a computer for accessing the biodiversity database and for downloading/uploading geographical data.	Year 1	Mapula Trust	Pending	Ensure that field staff have access to a computer with an internet connection for logging ad-hoc sightings and for loading/downloading geographical data.	Field staff have sufficient computer access to fulfil their roles in terms of this plan.	Approx. R15 000 for an adequate new computer
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## 4.3 Financial Management

<p><b>Objective Statement:</b> To ensure that reserve objects are sufficiently funded as far as possible.</p>	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Ensure the available annual budget and APO are aligned.</li> <li>Ensure that annual budgets are spent as planned.</li> <li>Ensure that the Mapula Trust remains in compliance with all relevant financial legal requirements in terms of South African law, in all transactions and dealings related to Bokbaai NR.</li> </ul>					
MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
<p>No specific tasks are required, beyond implementation and annual updating of this APO.</p>						

## 4.4 Signage, Access and Security

<p><b>Objective Statement:</b> To ensure that visitors to the reserve conduct themselves in a manner that is coherent with the objectives of this management plan and are assured of safety during their visit.</p>	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Ensure the landward perimeter of the reserve is fenced as a clear demarcation of the boundary, and that the fence remains in excellent condition.</li> <li>Rationalise and maintain signage at the main point of entry alongside the public road notifying entrants that they are entering Bokbaai Nature Reserve and providing rules and regulations in the form of pictograms where possible, but also as text where necessary.</li> <li>Maintain security measures currently in place and ensure that the security measures are reviewed at least once per year and after any security incident to ensure that they remain adequate.</li> <li>Make a reasonable attempt to de-proclaim the public road such that access to the reserve can be lawfully managed by the reserve.</li> </ul>					
MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
Patrol the fence	Weekly from year 1	Bokbaai NR field staff	Underway	Ensure that the boundary fence is patrolled at least three times per week.	Ensure that any breaches or fence damage is noted timeously for repair.	None - only staff time required
Maintain the fence	Ongoing	Bokbaai NR field staff	Underway	Undertake emergency repairs within 24 hours of noting a breach or serious maintenance issue. Undertake high quality repairs within one week of noting the issue. Minor maintenance issues must be addressed within two weeks.	Fence is maintained to a high standard.	Approximately R 10 000 per annum
Rationalise and maintain entrance signage	Year 2-3, ongoing maintenance	Mapula Trust	Pending	Ensure that entrance signage clearly displays the name of the reserve, emergency contact details, indicates that it is private property and indicates relevant reserve rules/regulations. Check that it is in a good state of repair. Replace if necessary.	Entrance signage clarifies is in a good state of repair and indicates all essential information.	Approximately R 3 500 for sign design update and replacement
Maintain records of unlawful activities	Ongoing	Security Staff	Underway	Ensure incident register is consistently used. Create electronic incident spreadsheet or database that is updated and uploaded to the online data repository once annually.	Incident data is available to staff, reviewers and selected researchers from the online repository.	None required
Public road deproclamation	Year 2-10	Mapula Trust	Pending	Attempt to de-proclaim the public road through official channels.	Road is de-proclaimed such that reserve access can be controlled.	None required

## 4.4 Firefighting

MANAGEMENT ACTIVITY	Timeframe	Responsibility	Progress	Action required	Target	Budget
<p><b>Objective Statement:</b> To ensure that lives and infrastructure are adequately protected from wildfire, that fire-related liability for the Mapula Trust is minimised and to ensure that burn frequency does not exceed natural limits.</p>		<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Maintain membership of the Greater Cederberg Fire Protection Association.</li> <li>Maintain adequate firebreaks.</li> <li>Ensure that reserve field staff are adequately equipped and trained to apply reasonable firefighting effort.</li> </ul>				
Maintain Greater Cederberg Fire Protection Association membership.	Ongoing	Mapula Trust	Underway	Attend required meetings and ensure active membership.	Maintain membership	None - only staff time required
Maintain adequate firebreaks for wildfire access and protection and create adequate temporary firebreaks for ecological burns.	Ongoing	Bokbaai NR field staff	Underway	Cut firebreaks by tractor in September each year as per operational guidelines.  Inspect the firebreaks in January to ensure compliance with firebreak requirements as per the operational management guidelines.	Firebreaks are operational throughout the fire season.	Continuation of current operations. No additional budget required.
Capacitate field staff for wildfire response by providing adequate equipment and training.	Year 1-2, ongoing maintenance	Mapula Trust	Partially implemented	Provide training and equipment to field staff as per the operational management guidelines.	Staff are fully capacitated for safe firefighting duties.	R 10 000 per annum to maintain and replace firefighting equipment as needed.

## APPENDIX E - Lists of potential SCC within the Bokbaai Nature Reserve.

**Table E1: Potential avifauna species of conservation concern within the Bokbaai NR.**

Species	Common Name	South African Conservation Status	IUCN Status	Presence
<i>Afrotis afra</i>	Southern black korhaan	Vulnerable	Vulnerable	Present
<i>Ardenna grisea</i>	Sooty shearwater	Near Threatened	Near Threatened	Possible
<i>Calidris canutus</i>	Red knot	Least Concern	Near Threatened	Possible
<i>Circus maurus</i>	Black harrier	Endangered	Vulnerable	Present
<i>Circus ranivorus</i>	African marsh-harrier	Endangered	Least Concern	Possible
<i>Hydroprogne caspia</i>	Caspian tern	Vulnerable	Least Concern	Possible
<i>Macronectes giganteus</i>	Southern giant-petrel	Near Threatened	Least Concern	Possible
<i>Microcarbo coronatus</i>	Crowned cormorant	Near Threatened	Least Concern	Likely
<i>Morus capensis</i>	Cape gannet	Vulnerable	Endangered	Possible
<i>Oxyura maccoa</i>	Maccoa duck	Near Threatened	Endangered	Possible
<i>Pelecanus onocrotalus</i>	Great white pelican	Vulnerable	Least Concern	Possible
<i>Phalacrocorax capensis</i>	Cape cormorant	Endangered	Endangered	Present
<i>Phalacrocorax neglectus</i>	Bank cormorant	Endangered	Endangered	Likely
<i>Phoenicoaias minor</i>	Lesser flamingo	Near Threatened	Near Threatened	Possible
<i>Phoenicopterus roseus</i>	Greater flamingo	Near Threatened	Least Concern	Possible
<i>Procellaria aequinoctialis</i>	White-chinned petrel	Vulnerable	Vulnerable	Possible
<i>Spheniscus demersus</i>	African penguin	Endangered	Endangered	Present
<i>Thalassarche melanophrys</i>	Black-browed albatross	Endangered	Least Concern	Possible

**Table E2: Potential plant species of conservation concern within the Bokbaai NR.**

Species	Common Name	South African Conservation Status	Presence
<i>Adenandra villosa subsp. biseriata</i>	-	Least Concern	Likely
<i>Adenogramma rigida*</i>	Rigid Muggiegrass	Endangered	Possible
<i>Agathosma glabrata*</i>	-	Endangered	Possible
<i>Agathosma latipetala*</i>	-	Endangered	Possible
<i>Amphithalea ericifolia subsp. erecta</i>	-	Critically Endangered	Likely
<i>Antimima aristulata</i>	-	Vulnerable	Likely
<i>Antimima limbata</i>	-	Endangered	Likely
<i>Arctotis angustifolia*</i>	-	Critically Endangered	Possible



<i>Argyrolobium velutinum</i>	-	Vulnerable	Likely
<i>Aspalathus lebeckioides</i>	-	Vulnerable	Likely
<i>Aspalathus lotoides subsp. Lagopus</i>	-	Vulnerable	Likely
<i>Aspalathus muraltioides*</i>	-	Endangered	Possible
<i>Athanasia rugulosa</i>	-	Endangered	Likely
<i>Babiana nana</i>	-	Endangered	Present
<i>Cannomois arenicola</i>	-	Endangered	Likely
<i>Chrysocoma esterhuyseniae*</i>	-	Critically Endangered	Possible
<i>Cleretum clavatum*</i>	-	Endangered	Possible
<i>Cliffortia hirta</i>	Hairy Rice Bush	Endangered	Likely
<i>Cliffortia longifolia*</i>	-	Vulnerable	Possible
<i>Codonorhiza azurea</i>	-	Endangered	Likely
<i>Cotula duckittiae</i>	-	Vulnerable	Likely
<i>Cotula eckloniana</i>	-	Vulnerable	Likely
<i>Cotula pusilla*</i>	-	Vulnerable	Possible
<i>Diosma dichotoma</i>	-	Endangered	Likely
<i>Drosanthemum hispifolium</i>	-	Vulnerable	Likely
<i>Echiostachys spicatus*</i>	Spiky Viperbrush	Endangered	Possible
<i>Elegia verreauxii*</i>	-	Vulnerable	Possible
<i>Empodium veratrifolium</i>	-	Endangered	Likely
<i>Galenia crystallina var. maritima</i>	-	Endangered	Likely
<i>Geissorhiza monanthos</i>	Wine Cup, Wynblommetjie	Endangered	Likely
<i>Geissorhiza purpurascens</i>	-	Endangered	Likely
<i>Geissorhiza radians</i>	Wine Cup, Wynblommetjie	Endangered	Likely
<i>Heliophila elata</i>	-	Vulnerable	Likely
<i>Hermannia procumbens subsp. procumbens</i>	-	Endangered	Likely
<i>Heterorhachis aculeata</i>	Koringdissel	Vulnerable	Likely
<i>Indigofera platypoda*</i>	-	Endangered	Possible
<i>Indigofera psoraloides*</i>	Clay Indigo	Endangered	Possible
<i>Isolepis venustula*</i>	-	Vulnerable	Possible
<i>Ixia curta</i>	-	Endangered	Likely
<i>Lachnaea capitata</i>	Lanky Stringbark	Vulnerable	Likely

<i>Lachnaea grandiflora</i>	-	Vulnerable	Likely
<i>Lampranthus amoenus</i>	-	Endangered	Likely
<i>Lampranthus aureus</i>	Golden Brightfig	Vulnerable	Likely
<i>Lampranthus filicaulis</i> *	Threadleaf Brightfig	Vulnerable	Possible
<i>Lampranthus glaucus</i> *	-	Vulnerable	Possible
<i>Lampranthus leptaleon</i> *	-	Endangered	Possible
<i>Lampranthus peacockiae</i>	-	Vulnerable	Likely
<i>Lampranthus spiniformis</i> *	-	Vulnerable	Possible
<i>Lampranthus stanfordiae</i>	-	Endangered	Likely
<i>Lampranthus stenopetalus</i>	-	Vulnerable	Likely
<i>Lebeckia plukenetiana</i> *	-	Endangered	Possible
<i>Lessertia argentea</i>	Strand-ertjiebos, Strandertjiesbos	Endangered	Likely
<i>Leucadendron cinereum</i>	Scraggly Conebush	Vulnerable	Likely
<i>Leucadendron lanigerum</i> var. <i>lanigerum</i> *	Common Shale Conebush	Endangered	Possible
<i>Leucospermum hypophyllocarpodendron</i> subsp. <i>canaliculatum</i>	Grey-snakeskin Pincushion	Vulnerable	Present
<i>Leucospermum hypophyllocarpodendron</i> subsp. <i>hypophyllocarpodendron</i>	Green-snakestem Pincushion	Vulnerable	Likely
<i>Leucospermum parile</i>	Malmesbury Pincushion	Endangered	Likely
<i>Leucospermum rodolentum</i>	Sandveld Pincushion	Vulnerable	Likely
<i>Leucospermum tomentosum</i>	Saldanha Pincushion	Vulnerable	Likely
<i>Limonium purpuratum</i>	Papierblom	Endangered	Likely
<i>Macrostylis cassiopoides</i> subsp. <i>Dregeana</i> *	-	Endangered	Possible
<i>Macrostylis villosa</i> subsp. <i>villosa</i>	-	Endangered	Likely
<i>Manulea corymbosa</i>	-	Vulnerable	Likely
<i>Metalasia capitata</i>	-	Vulnerable	Likely
<i>Microdon capitatus</i>	-	Endangered	Likely
<i>Muraltia macropetala</i>	-	Vulnerable	Likely
<i>Oncosiphon africanum</i>	Wild Chamomile	Vulnerable	Likely
<i>Pauridia canaliculata</i>	Geelpoublom	Endangered	Likely
<i>Pauridia linearis</i>	-	Vulnerable	Likely
<i>Phylica harveyi</i>	-	Vulnerable	Likely

<i>Phylica plumosa</i> var. <i>squarrosa</i>	-	Endangered	Likely
<i>Phylica strigulosa</i>	-	Vulnerable	Likely
<i>Phylica thunbergiana</i> *	-	Endangered	Possible
<i>Podalyria sericea</i>	-	Vulnerable	Likely
<i>Protea burchellii</i> *	Burchell's Sugarbush	Vulnerable	Possible
<i>Protea scolymocephala</i>	Thistle Sugarbush	Vulnerable	Likely
<i>Protea scolymocephala</i>	Thistle Sugarbush	Vulnerable	Likely
<i>Psoralea glaucina</i> *	Bloutee, Blouteebossie	Critically Endangered	Possible
<i>Pterygodium microglossum</i>	-	Endangered	Likely
<i>Restio impolitus</i>	-	Vulnerable	Likely
<i>Restio rigoratus</i> *	-	Endangered	Possible
<i>Roella arenaria</i>	-	Vulnerable	Likely
<i>Romulea eximia</i>	-	Endangered	Likely
<i>Ruschia geminiflora</i>	-	Vulnerable	Likely
<i>Ruschia tecta</i>	Sleaf Turretfig	Endangered	Likely
<i>Selago psammophila</i> *	-	Endangered	Possible
<i>Senecio foeniculoides</i>	Fennel-Leaved Groundsel	Critically Endangered	Likely
<i>Steirodiscus speciosus</i>	-	Critically Endangered	Likely
<i>Steirodiscus tagetes</i>	-	Vulnerable	Likely
<i>Wurmbea capensis</i> *	-	Vulnerable	Possible
<i>Xiphotheca reflexa</i>	Recurved Silver Pea	Endangered	Likely

**Table E3: Potential invertebrate species of conservation concern within the Bokbaai NR.**

Species	Common Name	South African Conservation Status	Endemism/other	Presence
<i>Stygionympha dicksoni</i>	Dickson's hillside brown	Critically Endangered (Possibly extinct)	WCP Endemic	Possible
<i>Chrysochrysis dicksoni</i>	Dickson's Strandveld copper	Critically Endangered		Likely
<i>Trimenia wallengrenii wallengrenii</i>	Wallengren's Silver-spotted Copper	Critically Endangered (Possibly extinct)	SA Endemic	Possible
<i>Aloeides thyra</i>	Red Copper	Endangered		Present
<i>Pachysoma aesculapius</i>	-	Vulnerable		Possible
<i>Bullacris obliqua</i>	Bladder grasshopper	Vulnerable	West Cost of SA Endemic	Likely

**Table E4: Potential reptile species of conservation concern within the Bokbaai NR.**

Species	Common Name	South African Conservation Status	Endemism/other	Presence
<i>Bitis armata</i>	Southern Adder	Vulnerable	WCP Endemic	Likely
<i>Scelotes gronovii</i>	Gronovi's dwarf burrowing skink	Near Threatened	WCP Endemic	Likely
<i>Scelotes montispectus</i>	Bloubergstrand dwarf burrowing skink	Near Threatened	WCP Endemic	Likely
<i>Typhlosaurus caecus</i>	Southern blind legless skink	Least Concern	WCP Endemic	Likely

**Table E5: Potential mammal species of conservation concern within the Bokbaai NR.**

Species	Common Name	South African Conservation Status	Endemism/other	Presence
<i>Mystromys albicaudatus</i>	White-tailed rat	Vulnerable	WCP Endemic	Likely
<i>Miniopterus schreibersii</i>	Common bent-wing bat	Near Threatened	WCP Endemic	Likely visitor
<i>Poecilogale albinucha</i>	African striped weasel	Near Threatened	WCP Endemic	Likely visitor – wide ranging
<i>Aonyx capensis</i>	African clawless otter	Least Concern	WCP Endemic	Likely
<i>Parahyaena brunnea</i>	Brown hyena	Near Threatened		Possible
<i>Acomys subspinosus</i>	Cape spiny mouse	Least Concern	WCP Endemic	Likely
<i>Bathyergus suillus</i>	Cape Dune Molerat	Least Concern	WCP Endemic	Likely
<i>Georchus capensis</i>	Cape Molerat	Least Concern	CapeNature Priority Species	Present
<i>Gerbilliscus afra</i>	Cape Gerbil	Least Concern	WCP Endemic	Present
<i>Pelea capreolus</i>	Grey Rhebok	Near Threatened		Possible