Western Cape Government
Environmental Affairs and Development Planning

Wadrift River Estuary Draft Estuarine Management Plan

2021

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Disclaimer

The Estuarine Functional Zone depicted in this estuarine management plan will be subject to change based on new data published from time to time.

EXECUTIVE SUMMARY

The National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008) (ICMA) was developed to facilitate the sustainable use and management of South Africa's coastline and coastal and estuarine resources. The ICMA requires that estuaries within South Africa be managed in a co-ordinated and efficient manner, and in accordance with the National Estuarine Management Protocol (NEMP), the National Coastal Management Programme (CMP) and the Western Cape CMP, which lay out specific objectives for management of the South African coastline, including estuaries. This document represents the first-generation Estuarine Management Plan (EMP) for the Wadrift River estuary developed under the auspices of the Western Cape Estuarine Management Framework and Implementation Strategy (EMFIS) a strategic project emanating from the provincial CMP, specifically priority area 7.

The purpose of this Draft EMP is to provide the vision of the future desired state of the Wadrift River estuary and guide the management of human activities in and around the system by setting out strategic objectives, management priorities and detailed management strategies with actions/activities. The co-ordination of the implementation of the EMP vests with the Responsible Management Authority (RMA) as per the NEMP.

Geographical Boundaries

The Wadrift River estuary (also commonly known as Wadriftvlei or Langvlei) is defined in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2019) as an arid predominantly closed estuarine system situated on the west coast of South Africa, approximately 13 km south of the town of Lamberts Bay and 12 km north of the town of Elands Bay, in the Cederberg Local Municipality (LM), West Coast District. It is located about 252 km north of Cape Town. The size of the estuary, as defined by Estuarine Functional Zone (EFZ), is approximately 509.8 ha, extending over a length of 3.2 km.

Vision and Objectives

The following vision for the Wadrift River estuary was proposed at a public meeting held in Lamberts Bay in August 2017 and supported in a second meeting held in November 2018.

Die Wadriftvlei is 'n gesonde ekosisteem wat vir huidige en toekomstige geslagte bewaar word

The Wadriftvlei is a healthy ecosystem that is protected for current and future generations

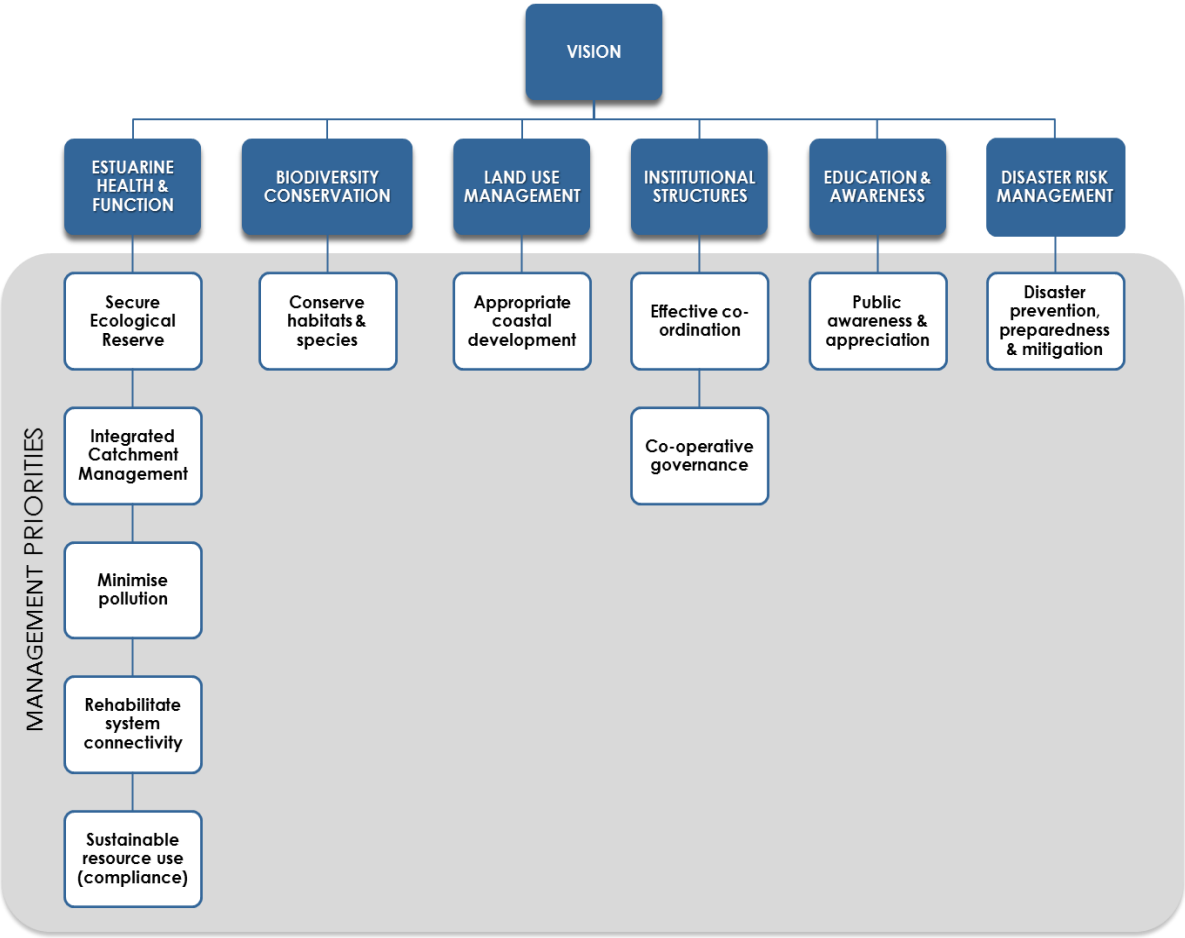
Strategic objectives, performance indicators and priorities for the Wadrift River estuary are as follows:

	Sector / Category	Strategic Objective	Performance Indicator(s)	Priority
1	Estuarine Health and Functioning	The ecological health and natural functioning of the Wadrift River estuary is improved, its negative ecological trajectory and catchment impacts reversed, living resources are sustainably managed and bird habitat function protected, even as the climate gets hotter and drier	• Improve the Ecological condition from an E to a D • Baseflow to estuary is restored • Water abstractions are controlled • Connectivity within the system is restored • Ecological health of estuaries is improved from E to D, and as dictated by water availability in a drier, hotter future climate • Projected future climate conditions and estuary requirements are integrated into catchment management processes • Water quality programme is in place • Best agricultural practice adopted & reduced agricultural return flows • Extractive resource use is controlled	**HIGH**
2	Biodiversity Conservation	The biodiversity of the Wadrift River estuary is conserved	• The value of the Wadrift as a bird sanctuary is preserved – Special Management Area established • EMP incorporated into the Cederberg Integrated Development Plan (IDP) and Spatial Development Framework (SDF) • Spatial zonation plan is adopted and enforced • Monitoring programmes are in place	**MEDIUM**
3	Land-use and Infrastructure Planning and Development	Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised	• All development and land use changes surrounding and within the EFZ comply with environmental legislation and environmental best practice / risk aversion approach • Bylaws developed and published • Further transformation of estuary prevented	**MEDIUM/ LOW (cross cutting with Ecosystem Health &Functioning in respect to rehabilitation)**
4	Institutional and Management Structures	The Wadrift River estuary is managed well through effective co-operative governance	• EMP is seamlessly incorporated into the Cederberg IDP and SDF • An integrated catchment management process, involving the agricultural sector and RMA, is instituted • RMA assigned & supported	**HIGH / MEDIUM**

			• Regional estuary advisory forum is established and meets regularly • Estuarine bylaws are drafted • Mandated authorities and participating agencies are well capacitated, actions are fulfilled	
5	Education and Awareness	Members of society are sensitive to, and aware of, the value and importance of the Wadrift estuary	• Awareness programme developed and on-going • Signage erected and information disseminated	**LOW**
6	Disaster Risk Management	Potential risks that could impact the Wadrift River estuary are reduced, inclusive of climate change impacts	• Rehabilitation programme developed • Key infrastructure is well defended • Contingency plans in place for high risk areas / activities / spills • Disaster impacts are timeously and effectively mitigated	**MEDIUM**

Priority management objectives and associated activities

An overview of the priority management objectives and management priorities is provided below. Detailed action plans were developed for each of these priority areas.



Proposed Zonation of activities

Despite its degraded state, the Wadrift River estuary is classified as a Critical Biodiversity Area, with its various supporting ecological habitats, because it plays a critical role in providing very limited wetland-type habitat for estuarine and coastal birds along the arid west coast. Acknowledging the regional functional and biodiversity value of the system, it is proposed that the entire EFZ be designated as a conservancy and included in the CapeNature stewardship programme.

In this regard, both landowners and activities on their properties, e.g. Sishen Railway, cultivation or livestock grazing, etc., need to work continuously toward the greater good of preserving the Wadrift River estuary, uplifting the health and biodiversity of the system, and preventing, minimising, and mitigating negative impacts.

As a conservancy, limited activities are encouraged in the EFZ, and these activities are directed toward accessing and appreciating nature. The primary purpose of this zone is to manage and direct low impact use and interaction so as to minimise impacts on the coastal environment.

Integrated monitoring plan

Monitoring is a crucial aspect of the adaptive estuarine management planning process as the generated data will be used to inform and update management decisions. Three broad categories of monitoring are incorporated into an integrated monitoring plan, namely resource monitoring, compliance monitoring and performance monitoring.

The only monitoring taking place on the Wadrift River estuary is the biannual counts (summer and winter) of the bird populations undertaken by CapeNature as part of the coordinated water bird counts (CWAC). It is imperative that this monitoring continues. The existing Department of Water and Sanitation (DWS) water level recorder within the Wadrift water body is not functional due to the exceedingly low water levels. In general, abiotic and biotic data on the Wadrift River estuary is severely lacking. The recommended minimum monitoring requirements to ascertain impacts of current and future pressures on the estuary detailing ecological component, monitoring action, temporal scale as well as spatial scale of monitoring is provided.

Currently there is no compliance monitoring taking place on the Wadrift River estuary in respect to marine living resources.

The performance monitoring plan is proposed to be used by the RMA, and/or identified implementing agents, to assess the effectiveness with which planned management activities contained in the EMP are being performed and ultimately to gauge progress in achieving the vision and objectives. A monitoring plan relative to the proposed management priorities is included.

Institutional Capacity and Arrangements

This EMP should be regarded as a strategic plan that can guide the detailing of management actions and identification of implementing agents. While it does not specify the required resources (human and financial) required for effective management of the estuary, it does provide for their prioritisation. Co-management and effective governance

have been identified as vital aspects to the efficient and effective management of the Wadrift estuarine system and key role players are identified.

The 2021 NEMP identifies the **Department of Environmental Affairs & Development Planning (DEA&DP)** (**provincial environmental department)**, or its assigned representative, as the RMA responsible for the co-ordination of the implementation of the Wadrift River Estuary EMP. I**t is noted that the NEMP allocates such responsibilities to the DEA&DP (provincial environmental department) unless agreement / or until agreement is reached with the respective body to undertake the coordination of the implementation process. Ultimately, the role of the RMA must be designated through formal signed agreement.** The estuary also falls within the Greater Cederberg Biodiversity Corridor, under the auspices of CapeNature. Thus, management of the Wadrift River estuary may entail a joint agreement (or delegation) between these two entities, if feasible.

While the establishment of an Estuary Advisory Forum (EAF) for each estuary is no longer a requirement in the NEMP, the Western Cape Government still support their establishment and recommend that private entities and non-government organisations continue to play a supporting role in the implementation of this EMP. While an individual EAF is not recommended, the establishment of a regional EAF is proposed, incorporating the Jakkalsvlei, Wadrift and Verlorenvlei estuarine systems. The EAF should be chaired by the RMA and should aim to meet on a quarterly basis.

Finally, key government departments and organs of state are identified, and a template provided for the conversion of the priority actions into detailed project plans, which must be prepared and adopted into the respective departmental implementation strategies.

In conclusion, the following items/issues are considered critical towards the ultimate achievement of the vision and should be immediately addressed and/or receive greatest effort in respect to human/financial resources:

- Legal water abstraction and agricultural best practice must be enforced;
- Conservation environmental custodianship by landowner encouraged and entire EFZ designated as a conservancy and included in the CapeNature stewardship programme;
- Appeal must be made for the redesign of the culverts under both the Transnet service road and Sishen railway line to allow for connectivity; and
- The DEA&DP to consider the appointment of a Regional estuarine management co-ordinator/champion within either DEA&DP or CapeNature, to support the RMA.

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ACRONYMS AND ABBREVIATIONS

amsl	Above mean sea level
BOfCMA	Berg-Olifants Catchment Management Agency
CARA	Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
CFR	Cape Floristic Region
CMA	Catchment Management Agency
CML	Coastal Management Line
CMS	Catchment Management Strategy
CPZ	Coastal Protection Zone
CSIR	Council for Scientific and Industrial Research
CWAC	Coordinated Waterbird Counts
CZ	Conservancy Zone
DALRRD	Department of Agriculture, Land Reform and Rural Development (formerly DAFF)
DAFF	Department of Agriculture, Forestry and Fisheries (now DALRRD / DEFF))
DEA	Department of Environmental Affairs (now DEFF)
DEA&DP	Western Cape Government's Department of Environmental Affairs & Development Planning
DEFF	Department of Environment, Forestry and Fisheries (formerly DEA / DAFF)
DMA	Disaster Management Act (Act No. 57 of 2002)
DoT	Department of Transport
DSL	Development Setback Line
DST	Department of Science and Technology
DWS	Department of Water and Sanitation
EAF	Estuary Advisory Forum
EFZ	Estuarine Functional Zone
EIA(s)	Environmental Impact Assessment
EMC	Estuarine Management Coordinator
EMFIS	Western Cape Estuarine Management Framework and Implementation Strategy
EMP	Estuarine Management Plan(s)
GCBC	Greater Cederberg Biodiversity Corridor
GDP	Gross domestic product
HWM	High Water Mark
I&APs	Interested and Affected Parties
ICM	Integrated Coastal Management
ICMA	National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008)
IDP	Integrated Development Plan
LED	Local Economic Development
LM	Local Municipality
LUPA	Land Use Planning Act (Act No. 3 of 2014)
MEC	Member of the Executive Council
MLRA	Marine Living Resources Act (Act No. 18 of 1998) as amended
MOU	Memorandum of Understanding
MRPDA	Mineral Resources and Petroleum Development Act (Act No. 28 of 2002)
MSA	Municipal Systems Act (Act No. 32 of 2000)
NBA	National Biodiversity Assessment
NEM: BA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM: PAA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMP	National Estuarine Management Protocol (2013)

NWA	National Water Act (Act No. 36 of 1998)
PAES	Protected Area Expansion Strategy
RDM	Resource Directed Measures
REC	Recommended Ecological Category
RMA	Responsible Management Authority
SAR	Situation Assessment Report
SDF	Spatial Development Framework
SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
WC DoT&PW	Western Cape Department of Transport: Public Works
WC TIA	Western Cape Transport Infrastructure Act (Act No. 1 of 2013)
WCDM	West Coast District Municipality
WQ	Water Quality
WRC	Water Resource Commission
WUA	Water Users Association
WUL	Water Use Licence
WWTW	Waste Water Treatment Works

1 INTRODUCTION

1.1 Background

The National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008) (ICMA) was developed to facilitate the sustainable use and management of South Africa's coastline and coastal and estuarine resources. The ICMA requires that estuaries within South Africa are managed in a co-ordinated and efficient manner, and in accordance with the 2013 National Estuarine Management Protocol (hereafter referred to as the NEMP), the National Coastal Management Programme (CMP) and the Western Cape CMP, which lay out specific objectives for management of the South African coastline, including estuaries.

In response to the directive issued under the ICMA and the NEMP, the Western Cape Government, and specifically the Provincial Department of Environmental Affairs and Development Planning (DEA&DP), commissioned the development of the Western Cape Estuarine Management Framework and Implementation Strategy (EMFIS), a strategic project emanating from the provincial CMP, specifically priority area 7, to facilitate the consistent development and implementation of Estuarine Management Plans (EMPs) in the Western Cape Province.

This document represents the first generation EMP for the Wadrift (or Langvlei) estuary (Figure 1) developed under the auspices of the Western Cape EMFIS.

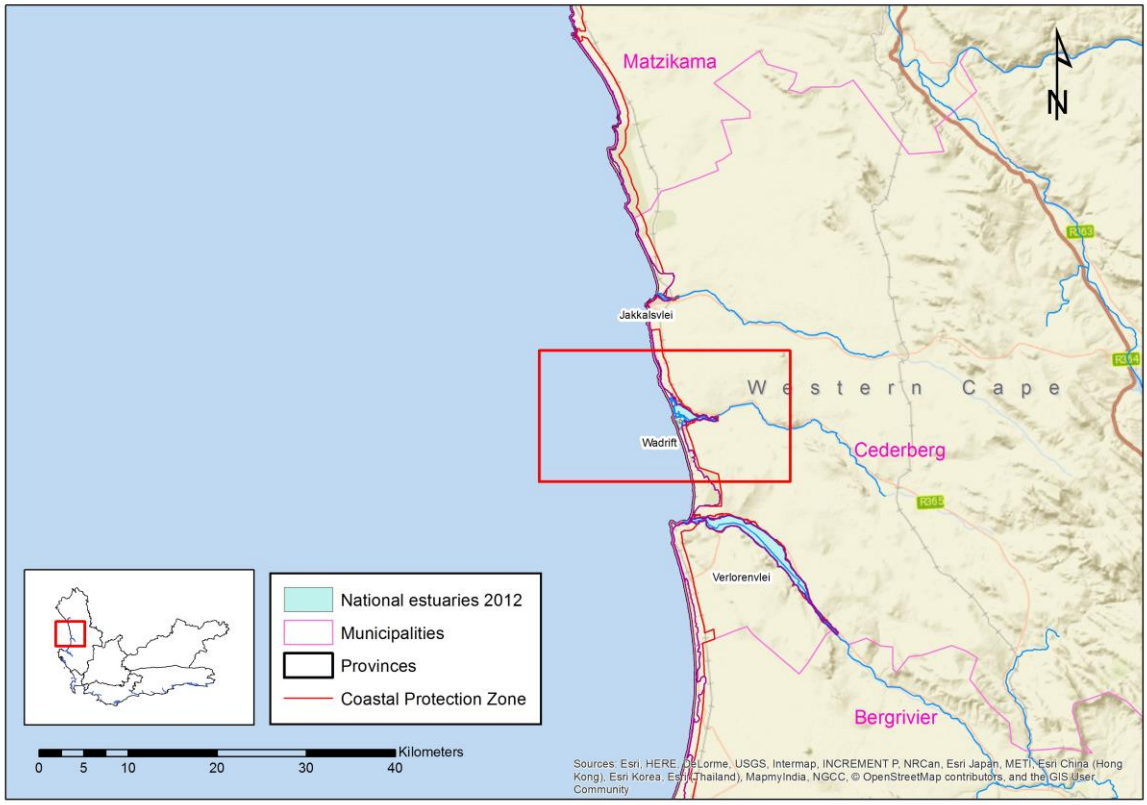

Figure 1: Location of the Wadrift River estuary within the Cederberg Local Municipality

1.2 Purpose of the EMP

The development of an EMP is a three-phase process, as illustrated in Figure 2, comprising an initial scoping phase, followed by an objective setting phase, and finally an implementation phase. An adaptive management approach should be adopted during the latter phase with detailed reviews bring conducted at five-yearly intervals.

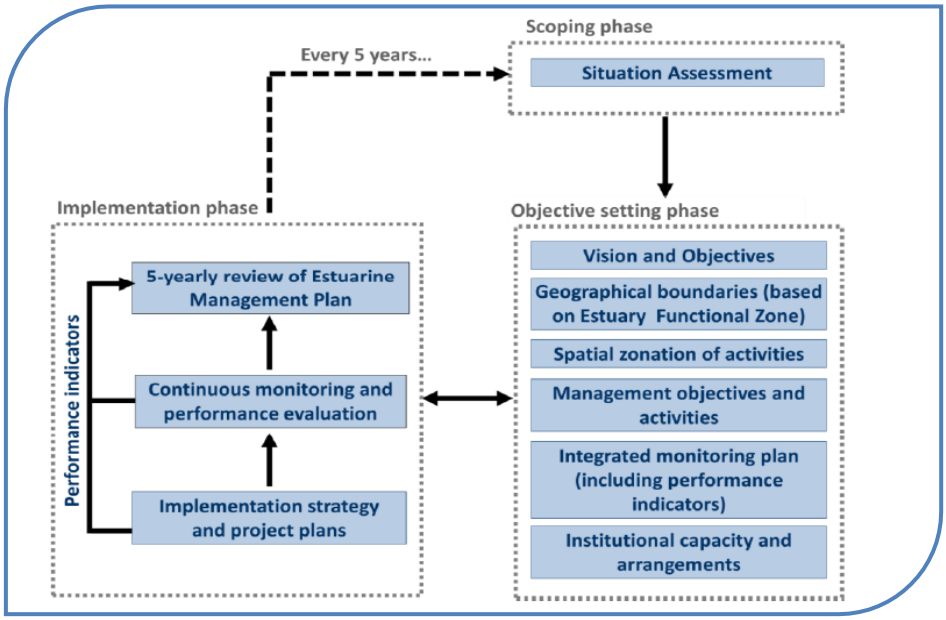

Figure 2: A framework for integrated estuarine management in South Africa

This report constitutes the second objective and core component of the estuarine management planning process, namely the EMP. The purpose of this component is to provide the vision of the future desired state of the Wadrift River estuary and guide the management of human activities in and around the system by setting out strategic objectives, management priorities and detailed management strategies with actions/activities.

Estuarine management is by definition not only focused on the Estuarine Functional Zone (EFZ) but inclusive of coastal hinterland and marine influences, shoreline status, catchment management, climate change and human development impacts such as tourism, recreation and agriculture, amongst many others. This EMP is the primary document for use by the identified responsible management authority (RMA) to facilitate coordination of the identified management interventions to ultimately ensure the longevity of the estuarine system concerned. This is also the critical reference document for the incorporation of estuarine management into the municipal Integrated Development Planning (IDP) and Spatial Development Framework (SDF) processes.

1.3 Mandate and responsibilities of the RMA

The co-ordination of the implementation of the EMP vests with the RMA as per the NEMP. One of the strategic objectives of this EMP is to promote and facilitate the cooperative governance relationship between the RMA and an existing or new estuary advisory forum

(EAF), or any other supporting structures or organisations with estuarine-related duties and functions.

The designated RMA is responsible for the development of the EMP[1] and the overall co-ordination of the actions of other implementing agencies, and not necessarily the implementation actions themselves. Section 7.3 of the NEMP indicates that:

"…management actions…shall be translated into project plans by the responsible government department that is responsible for certain aspects of estuary management (as per legislative mandates…"

Specifically, the RMA responsibilities are described by the NEMP as:

Section 5:	*"…authorities are **responsible for the development of EMPs** and **coordination of the implementation process**…"*
Section 5(e):	*"The identified responsible management authority to develop the EMP needs to **budget accordingly for the development of these plans**."*
Section 8(1):	*"The responsible management authority developing an EMP must **actively engage all the relevant stakeholders** including government departments, non-government organisations and civil society in the development and implementation of the EMP."*
Section 9.1(1) and 9.2:	*"…it **must obtain formal approval** for the EMP…" and "Once approved…the EMP shall be… **Integrated**.." and "**incorporated** into the Provincial Coastal Management Programme."*

The responsible body contemplated in Section 33(3)(e) of the ICMA who develops an EMP must:

a) follow a public participation process in accordance with Part 5 of Chapter 6 of the ICMA;
b) ensure that the EMP and the process by which it is developed are consistent with:
   i) the NEMP; and
   ii) the National CMP and with the applicable provincial CMP and CMP referred to in Parts 1, 2 and 3 of Chapter 6 of the ICMA;
c) If applicable, ensure that relevant legislation is enacted to implement the EMP; and
d) Submit an annual report to the Minister on the implementation of the EMP, the legislation and any other matter.

Coordination of the implementation actions by the RMA and its strategic partners can be supported by an EAF representing all key stakeholder groups on the estuary.

[1] In this instance, the EMP for the Wadrift River estuary was developed under the auspices of the Western Cape EMFIS commissioned by the Western Cape Government.

1.4 Structure of Report

This report is structured as follows:

- **Section 2** introduces the estuary and details the **geographical boundaries** of the estuary, i.e. the management area to which this EMP applies;
- **Section 3** provides a synopsis of the **situation assessment,** thereby providing context to the vision, strategic objectives and management objectives and management priorities;
- **Section 4** presents the **local vision and strategic objectives** as informed by the stakeholders, for the management of the Wadrift River estuary. They collectively describe the desired future state and provide the overarching logical framework for the action plans;
- **Section 5** prescribes the **management priorities and associated activities,** i.e. the required actions to be undertaken within the next 5 years, captured as individual action plans. This EMP contains refined or detailed management objectives accompanied by action plans to facilitate implementation, and in this manner, serves to mobilise and co-ordinate all relevant government departments, institutions and other role players to undertake specific actions within their mandate or sphere of influence;
- **Section 6** describes the various components and zones included in the proposed **spatial zonation** of the estuary;
- **Section 7** set out the **integrated monitoring plan** encompassing resource monitoring, compliance monitoring, as well as performance monitoring in respect to achieving the objectives of the EMP;
- **Section 8** details the **institutional capacity and proposed arrangements** that are required to implement the actions contained in the plan, including key role players and participating institutions, and the recommended projects provided for in the action plans; and
- **Section 9** details key **recommendations** and **concludes** the plan.

2 GEOGRAPHICAL BOUNDARIES

The Wadrift River estuary (also commonly known as Wadriftvlei or Langvlei) is defined in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2019) as an arid predominantly closed estuarine system situated on the west coast of South Africa, approximately 13 km south of the town of Lamberts Bay and 12 km north of the town of Elands Bay, in the Cederberg Local Municipality (LM), West Coast District. It is located about 252 km north of Cape Town. The size of the estuary, as defined by Estuarine Functional Zone (EFZ), is approximately 509.8 ha, extending over a length of 3.2 km. The geographical boundaries of the Wadrift River estuary, delineating the EFZ, are provided in Table 1 and illustrated in Figure 3.

Table 1: Geographical boundaries of the Wadrift estuary

Downstream boundary:	-32.204468° S, 18.325781° E (estuary mouth)
Upstream boundary:	-32.211634° S, 18.376910° E (head of the estuary)
Lateral boundaries:	Approximated by the 5 m above Mean Sea Level (amsl) contour along each bank

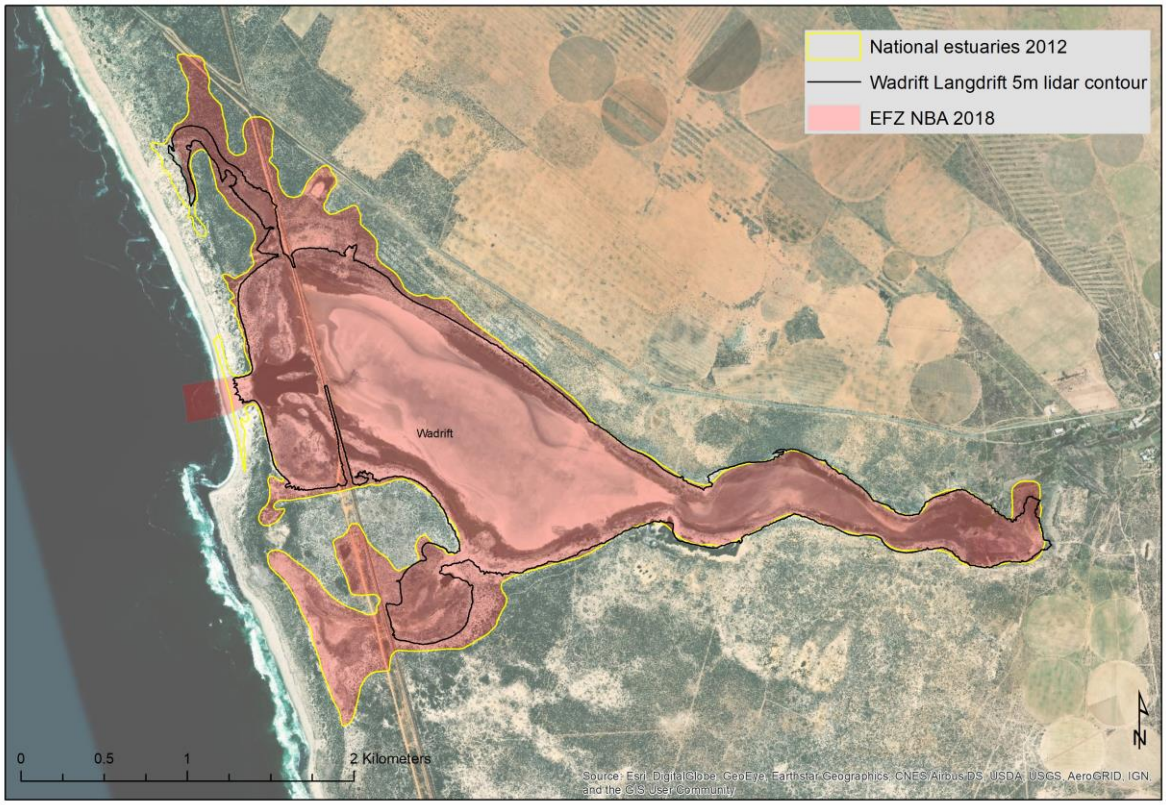

Figure 3: Geographical boundaries of the Wadrift River estuary EFZ showing the 5 m topographical contour and the 2018 NBA (SANBI 2019) EFZ boundary

3 SYNOPSIS OF THE SITUATION ASSESSMENT

Introduction

The Wadrift estuary (also commonly known as Wadriftvlei or Langvlei) is defined in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2019) as an arid, predominantly closed estuarine system. It falls within the Cederberg Local Municipality (LM) which experiences hot dry summers and cold wet winters with annual rainfall of as little as 170 mm per annum along the coastline (classified as semi-desert). Average daily temperatures along the coast range from 18°C in winter to 29°C in summer. The underlying geology of the Wadrift estuary comprises the granitoid Kalahari Craton, overlain by recent Quaternary sediments. Above the estuary, the area is underlain by Malmesbury Group Shales with overlying sandstone of the Piekenierskloof, Graafwater and Peninsula Formations of the Table Mountain Group.

The landscape of the Cederberg LM is characterised by the Sandveld, and the Cederberg Mountain range. The latter has contributed to the prevalence of natural landcover throughout the municipal area (74%). Production (agricultural) is relatively low (18%), resulting in a less extensive urban and infrastructure land cover. Water availability for irrigation is a major factor inhibiting agricultural intensification and thus irrigated crops are sourced along the Olifants River valley. Large portions of the coastal zone between the main coastal towns, namely Elands Bay (Verlorenvlei River estuary) and Lamberts Bay (Jakkalsvlei River estuary), remain natural as it is relatively unsuited to agriculture. However, potato farming is placing increasing pressure on coastal biodiversity.

Abiotic Function

The catchment area of the Wadrift estuary falls within the Berg-Olifants Water Management Area, and the mainstream river to the estuary is known as the Langvlei River, which is approximately 60 km long, drains an estimated area of 750 km^2. The size of the estuary, as defined by estuarine functional zone, is approximately 509.8 ha, extending over a length of 5.45 km.

In general, very little is known about the hydrology of the Wadrift system. Hydrological estimations suggest that the present day mean annual runoff (9.8 million m^3/a) of the estuary is reduced from natural runoff (13.3 million m^3/a), and that baseflows, flow duration and the onset of high flow season have seen major shifts as a result of over abstraction. The Wadrift estuary is the primary water supply for Lamberts Bay, via groundwater abstraction, which began in the late 1970's, and had a significant negative impact on the ecological structure and function of the system.

The lower reaches, and overall hydrodynamics of the Wadrift estuary have been critically modified by the major construction of the Sishen-Saldanha railway line and the adjacent road infrastructure and causeway in the 19070's. The poor design of the culverts through each the railway line embankments and the causeway has resulted in the severance of the mouth region from the main estuary body, and the prevention of seawater influx into the system, thus affecting salinity concentrations in both parts of the present system. Due to reduced freshwater inflow, large parts of the vlei have dried up, and it appears that significant sedimentation has occurred. Breaching and especially the duration of open

mouth conditions is likely less frequent than under natural conditions, due to reduced runoff and the existence of the culvert obstructions.

In respect to water quality, when there is water in the system, the Wadrift estuary comprises a hypersaline section between the sea and the railway crossing and a shallow brackish main waterbody. This is markedly different to predicted reference conditions, in that salinity concentrations were likely remain very fresh for years at a time during extended periods of closed mouth conditions (coupled with river inflow) and would only receive seawater input during infrequent open mouth conditions or overtopping of the sandbar. The water quality from the catchment is moderately enriched with nutrients due to poor agricultural practises.

Biotic Function

The vegetation of the Wadrift estuary comprises three dominant types, namely Arid Estuarine Salt Marshes (177.5 ha), Lamberts Bay Strandveld (132.2 ha) and Cape Seashore Vegetation (96.9 ha). Since no detailed study has ever been conducted on any of the ecosystem aspects of this system, with the exception of bird counts, there is little to no information is available for invertebrates and fish. The Wadrift estuary is not highly important from a fish perspective and recruitment is likely very sporadic, estimated at once in 20 years.

In respect to birds, a total of 60 different species of inter-seasonally and/ or inter-annually water birds have used the estuary over a period of 16 years. The number of bird species and the total number of birds present always peaked in years when the system was recorded as full or partially full at the time of the count. Southern African pan-coastal migrants, such as flamingos, derive the most benefit from ephemeral coastal pans such as Wadrift estuary. The estuary is deemed complementary to the avifaunal habitat provided by the neighbouring Verlorenvlei and sustaining the environmental integrity of the aggregate area is of international importance.

Ecological Health Status, Importance, and Recommended Future State

The ecological health of the Wadrift estuary is in an E Category, that is, 'seriously modified', where the loss of natural habitat, biota and basic ecosystem functions is extensive. In terms of conservation importance, the estuary is not one of the national priority estuaries requiring formal protection and it is deemed to be of 'average importance' in respect to biodiversity value due to its small size. However, the Wadrift estuary is known as an important site for its rich bird diversity. Based on the average ecological importance overall, the recommended ecological condition for the Wadrift estuary is a Category D. However, it is noted that the 2013 Reserve Determination study recommends a Category C (DWA, 2013) and the 2018 National Biodiversity Assessment (SANBI, 2019) suggests a Category E.

Important Ecosystem Goods and Services

Estuaries typically provide a range of services that have economic or welfare value. However, it is evident that the Wadrift estuary provides very limited ecosystem services due to its largely modified state. Even with its large expansive area, the Wadrift estuary provides limited goods and services.

Impacts and Potential Impacts

The environmental processes, activities and developments that pose a threat to the Wadrift estuary include the following:

- *Environmental hazards* – drought, floods and climate change impacts;
- *Land-use and infrastructure development* – poor design and construction of the Sishen-Saldanha railway bridge, adjacent road infrastructure and causeway, reduced connectivity with the sea and within the artificial separated water bodies; and
- *Water quality and quantity issues* - reduction in river inflow reaching the estuary and increased nutrient load from the catchment.

Socio-economic Context

The Cederberg LM is the least populated local municipality within the West Coast District municipal area. While population density is relatively low the provision of basic services (namely water and lighting) is relatively high, such that 83% have access to piped water within their dwellings, and 96.6% have electricity for lighting (StatsSA, 2016). Approximately 57% of the population are economically active, and of these 6% are unemployed (StatsSA, 2016). The youth unemployment rate is slightly higher at 13.8% (StatsSA, 2011). Of all the municipalities in the district, the Cederberg LM had the lowest Human Development Index score of 0.6 and the highest poverty rate of 42.7%, compared to the district poverty rate of 30.4% (Cederberg IDP, 2017).

The Wadrift estuary and its catchment falls within the very rural, and largely undeveloped, Ward 5 of the Cederberg LM, which has a total population of 9141. The population density (8 persons/km^2) of the ward is greater than the overall municipal density (StatsSA, 2011). This is due to the urbanised coastal areas of Lamberts Bay and Elands Bay. In terms of the municipal economy, the Cederberg economy grew by 2.2% per annum between 2000 and 2010 and contributed 9.2% to the West Coast District Gross Domestic Product (GDP) in 2010 (Cederberg IDP, 2017). The four main sectors contributing to this growth were construction; mining and quarrying; transport, storage and communication; and finance, insurance and business services (Cederberg IDP, 2017). The agriculture and fishing sector is by far the largest sector in the municipality, contributing 30% of the GDP (reflecting the largely rural nature of the municipal area) and providing the largest number of employment opportunities (35%) (Cederberg IDP, 2017). Tourism does not make a very large contribution to the local economy, and limited tourism growth opportunities exist (Cederberg IDP, 2017). Nonetheless, surfing at Elands Bay and fishing in Lamberts Bay make a small contribution to the local economy (Cederberg IDP, 2017).

The direct and indirect benefits derived from estuarine ecosystems services are manifested directly or indirectly in tangible income and employment. The main form of social dependency associated with the Wadrift estuary relates to the provision of groundwater, primarily as potable water supply to Lamberts Bay and to the surrounding farmers for irrigation. However, current rates of groundwater abstraction are unsustainable. There appears to be no other direct uses of the estuary. Local Economic Development (LED) projects related to the coast are focussed on the main coastal settlements. No LED opportunities have been identified directly related to the Wadrift estuary. Limited opportunities exist to provide tour-guiding services to bird-watchers intent on seeing migrant bird species.

Legislative Instruments and relevant Strategies, Plans and Policy Directives

The legislative framework specific to estuarine management is the National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008) (ICMA) and the accompanying NEMP. The NEMP provides national policy and ensures alignment by providing a national vision and objectives for achieving effective integrated management of estuaries, amongst other things. The NEMP identifies the responsible management authority per estuary, in this instance the DEA&DP. Key legal instruments that are applicable to estuarine management are then described, and include national, provincial and local management documents.

Opportunities and Constraints

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis for the management of the Wadrift estuary was undertaken. One of the main strengths is the absence of urban development and sparsely populated landscape surrounding the estuary and its potential as a sanctuary area. Ongoing abstraction from the system and in the catchment, is deemed the negative impact and threat to any potential restoration efforts. Other threats include illegal camping, the costs of rehabilitation as well as uncoordinated and haphazard management interventions. Opportunities include the imminent appointment of an environmental officer in the Cederberg Municipality, accessing funding via various programmes as well as a relatively simple solution to the design flaw of the culverts which restrict connectivity with the sea.

The Wadrift estuary was not identified as a national priority estuary in need of formal protection at the national level, however, it does fall within the Greater Cederberg Biodiversity Corridor. In this regard, it should be afforded some level of sustainable management (e.g. implementation of agriculture best practise for surrounding farmlands, abstraction restrictions). In respect to priority restoration activities, base flows to the estuary must be maintained/increased, No large dams or weirs and new licenses (in the summer low flow period) must be permitted on the mainstream of the Langvlei River, catchment water quality must be improved, and no development should be permitted in the estuarine functional zone in order to achieve the Recommended Ecological Category (REC).

Information Gaps and Recommendations

Since no detailed study has ever been conducted on any of the ecosystem aspects of this system, with the exception of coordinated water bird counts (CWAC), very little to no quantitative data exists to assess ecosystem health. Inferences can only be made on the state of the Wadrift estuary based on expert opinion, information gathered during the site visits and anecdotal reports. There is specifically very little reliable information available on the physical processes of the Wadrift estuary and more needs to be done on the hydrology to confirm the current status quo.

Thus, detailed studies are required on all biotic and abiotic aspects to improve our knowledge and understanding of the system. A minimum long-term monitoring programme is recommended for ascertaining the impacts of current and future pressures on the condition on the estuary, in line with the methods for the determination of the ecological water requirements for estuaries.

4 VISION & OBJECTIVES

4.1 Vision

The Vision for an estuary should be inspirational, representing a higher level of strategic intent and aligned with the strategic objectives of the NEMP, Western Cape CMP and the greater Cape Floristic Region (CFR). The National Vision and Vision of the Estuaries of the CFR are as follows:

The estuaries of South Africa are managed in a sustainable way that benefits the current and future generations

The estuaries of the CFR will continue to function as viable systems which are beautiful, rich in plants and animals, attract visitors, sustain our livelihoods and uplift our spirits

The 2016 Western Cape Provincial Coastal Management Programme (PCMP), which identifies estuarine management as one of its nine priority areas and sets out the goal for the Western Cape as:

Co-ordinated and integrated estuarine management which optimises the ecological, social and economic value of these systems on an equitable and sustainable basis

The following vision for the Wadrift River estuary was proposed at a public meeting held in Lamberts Bay in August 2017, and supported in a second meeting held in November 2018:

Die Wadriftvlei is 'n gesonde ekosisteem wat vir huidige en toekomstige geslagte bewaar word

The Wadriftvlei is a healthy ecosystem that is protected for current and future generations

The vision highlights the following aspects of the estuary that are valued and need to be preserved or enhanced:

- The desire to preserve the system in a healthy (and functional) state; and
- The need to manage catchment activities in a sustainable manner to ensure the longevity of estuary.

4.2 Strategic Objectives

Objectives are qualitative statements of the values derived from the vision and typically reflect the overarching issues. They should answer the following question, "*How will you know when you have achieved the Vision?*". The strategic objectives inform the development of the detailed management strategies that are carried forward as plans of action.

The strategic objectives for the Wadrift River estuary were discussed at the stakeholder meeting. Based on the feedback received from the participants, the strategic objectives for the Wadrift River estuary align with the following identified sectors or categories of issues (Figure 4):

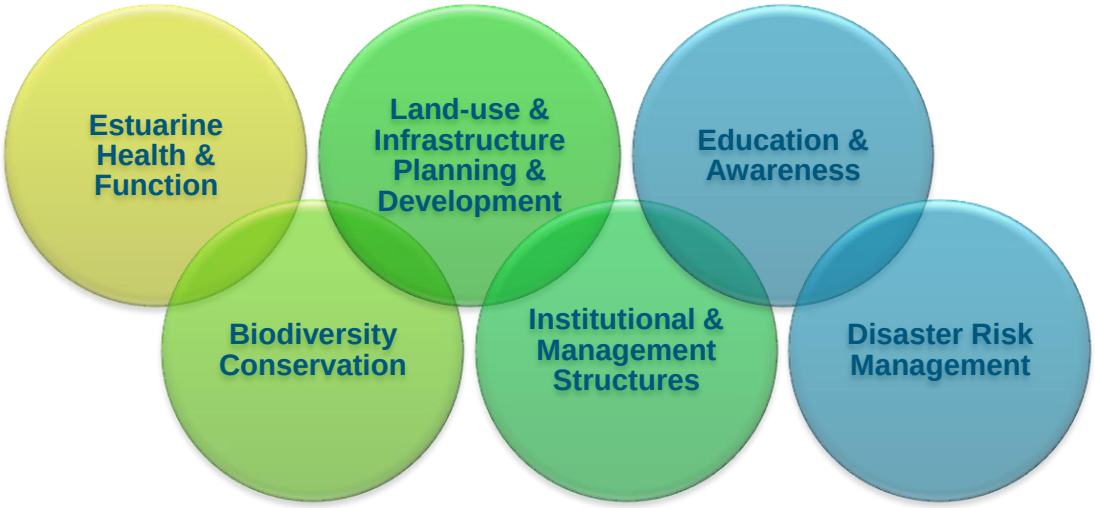

Figure 4: Sectors or categories of issues relevant to the management of the Wadrift River estuary

According to these categories, the strategic objectives for the Wadrift River estuary are as follows:

Table 2: Strategic Objectives for management of the Wadrift River estuary, their indicators and level of priority

	Sector / Category	Strategic Objective	Performance Indicator(s)	Priority
1	Estuarine Health and Functioning	The ecological health and natural functioning of the Wadrift River estuary is improved, its negative ecological trajectory and catchment impacts reversed, living resources are sustainably managed and bird habitat function protected, even as the	• Improve the Ecological condition from an E to a D • Baseflow to estuary is restored • Water abstractions are controlled • Connectivity within the system is restored • Ecological health of estuaries is improved from E to D, and as	**HIGH**

		climate gets hotter and drier	dictated by water availability in a drier, hotter future climate • Projected future climate conditions and estuary requirements are integrated into catchment management processes • Water quality programme is in place • Best agricultural practice adopted & reduced agricultural return flows • Extractive resource use is controlled • Monitoring programmes are in place	
2	Biodiversity Conservation	The biodiversity of the Wadrift River estuary is conserved	• The value of the Wadrift as a bird sanctuary is preserved – Special Management Area established • EMP incorporated into the Cederberg IDP and SDF • Spatial zonation plan is adopted and enforced	**MEDIUM**
3	Land-use and Infrastructure Planning and Development	Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised	• All development and land use changes surrounding and within the EFZ comply with environmental legislation and environmental best practice / risk aversion approach • Bylaws developed and published • Further transformation of estuary prevented	**MEDIUM/ LOW (cross cutting with Ecosystem Health &Functioning in respect to rehabilitation)**
4	Institutional and Management Structures	The Wadrift River estuary is managed well through effective co-operative governance	• EMP is seamlessly incorporated into the Cederberg IDP and SDF • An integrated catchment management process, involving the agricultural sector and RMA, is instituted • RMA assigned & supported • Regional estuary advisory forum is established and meets regularly • Estuarine bylaws are drafted • Mandated authorities and participating	**HIGH / MEDIUM**

			agencies are well capacitated, actions are fulfilled	
5	Education and Awareness	Members of society are sensitive to, and aware of, the value and importance of the Wadrift estuary	• Awareness programme developed and on-going • Signage erected and information disseminated	**LOW**
6	Disaster Risk Management	Potential risks that could impact the Wadrift River estuary are reduced, inclusive of climate change impacts	• Rehabilitation programme developed • Key infrastructure is well defended • Contingency plans in place for high risk areas / activities / spills • Disaster impacts are timeously and effectively mitigated	**MEDIUM**

5 PRIORITY MANAGEMENT OBJECTIVES AND ASSOCIATED ACTIVITIES

After the review of the background information, as well as after conducting stakeholder engagement, a SWOT analysis of the Wadrift River estuary under the current management practices was prepared (Table 3).

Table 3: SWOT Analysis

STRENGTHS *(highlights, uniqueness?)*	**WEAKNESSES** *(what could you improve?)*
• Undeveloped, sparsely populated landscape • West Coast Integrated Coastal Management Plan has been developed to facilitate co-ordinated management • Shared service agreement between LM and Western Cape District Municipality (WCDM) for assistance with environmental studies and expertise • Isolated location of system could allow it to be a sanctuary area	• Severe degradation and loss of biodiversity • Degraded ecosystem services • Over abstraction of water • Height of floor of culverts does not allow connectivity to the sea • No access or use of the vlei as it is located on private property. • Lack of/limited capacity, resources (human and financial) and knowledge for Integrated Coastal Management (ICM) (SRK, 2013) • Absence of dedicated environmental/ coastal management department (SRK, 2013) • Heavy reliance of LM on WCDM and other associations for input and assistance (SRK, 2013) • Uncertainty regarding Roles and Responsibilities
OPPORTUNITIES *(opportunities for positive change)*	**THREATS** *(what could prevent the EMP from working?)*
• Appointment of environmental officer • Rehabilitate portions of estuary • Research opportunities regarding the hypersaline invertebrate communities and genetics • Accessing government funding via the Working for Water as well as Working for the Coast Programmes • Relatively simple construction activity to lower the floor of culverts allowing for connectivity • Possible livelihoods opportunities (harvesting of reeds) • Sustainable abstraction	• Ongoing over-abstraction of groundwater resources • Illegal camping and driving in the Conservancy Zone (CZ)/EFZ • Excessive costs i.r.t. rehabilitation of estuary • Possible further destruction caused by mineral prospecting/mining • Limited alternative livelihood/LED opportunities • Reactionary (vs proactive) response to management requirements when necessary • Uncoordinated and haphazard management interventions • Climate change and loss of aquatic ecosystem

The management objectives detailed below were informed by the SWOT analysis and critical issues identified as part of the scoping phase. They represent the focus areas for the 5-year cycle of this EMP. An illustrative overview of the priority management objectives for the Wadrift River estuary is provided in Figure 5 below.

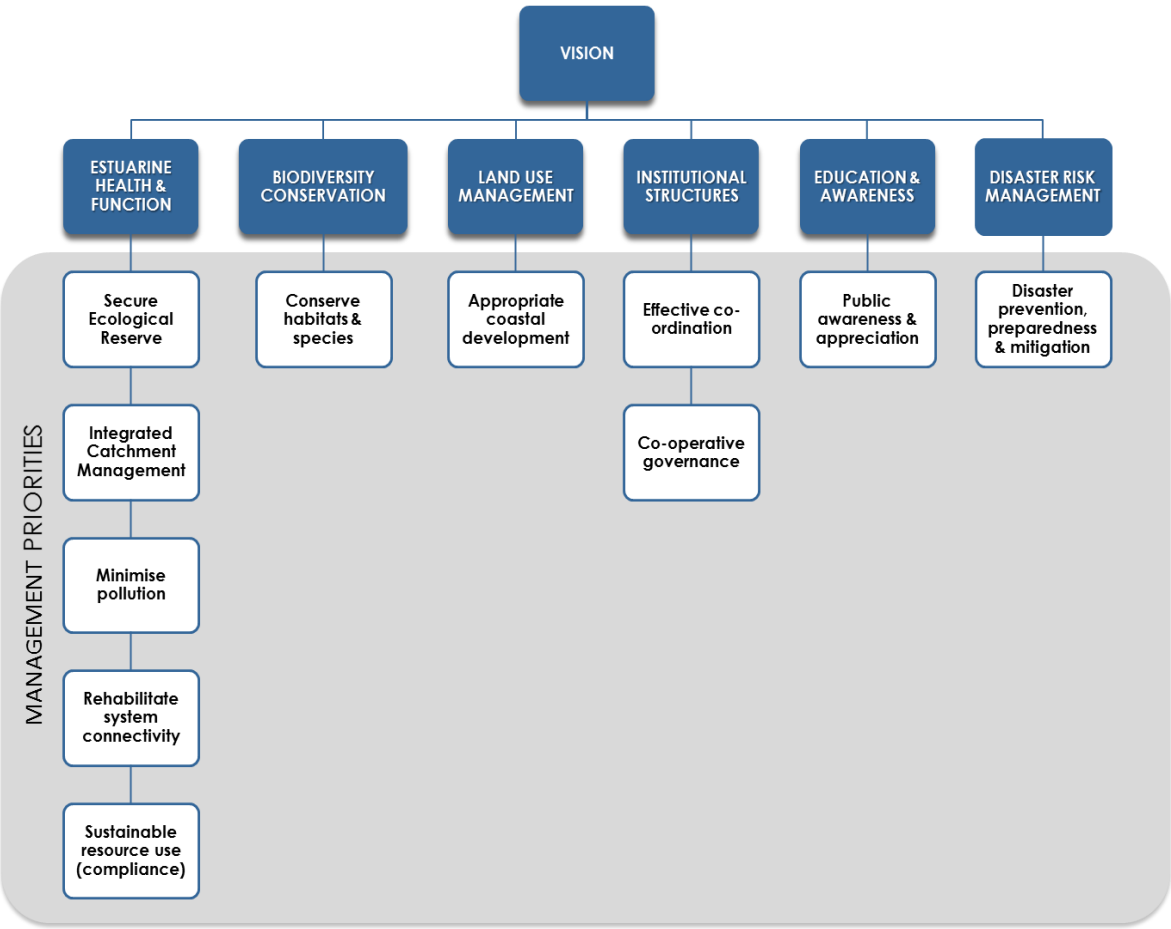

Figure 5: Summary of priority management objectives per management sector

5.1 Estuarine Health and Function

<u>Strategic Objective 1</u>: The ecological health and natural functioning of the Wadrift River estuary is improved, its negative ecological trajectory and catchment impacts reversed, living resources are sustainably managed and bird habitat function protected

Table 4: Management Objectives and Actions for Estuarine Health and Function (includes water quantity and quality as well as utilisation of living resources)

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 1.1: Secure adequate quantity and quality of freshwater input to improve ecosystem health and functioning					
a.	Lobby Department of Water and Sanitation (DWS) Minister to sign off the recommended freshwater reserves, ensuring that the minimum flow requirement (specifically baseflow) for the estuary is restored, subject to considerations of projected climate change, and including no dams or weirs on the Langvlei River and no new licenses for water abstraction in summer (low flow) period of the year	National Water Act (NWA)	• Meetings held and correspondence written • Recommended reserve(s) signed off • Baseflow is restored • Ecological condition improved from E to D category • Projections of reduced future water availability due to reduced overall rainfall, fewer rain days and higher average temperatures are taken into consideration in the water use allocations	HIGH	Berg-Olifants Catchment Management Agency (BOfCMA), RMA
b.	Once classification study signed off, follow up on implementation of water resource classification process	NWA	• Meetings held and correspondence written • Water resource classified • Baseflow is protected	HIGH	BOfCMA, RMA
c.	Install flow gauging probe in the catchment above the estuary (if identified as priority estuary) * with continuous monitoring	NWA	• Importance of Wadrift identified/prioritisation completed • Wadrift identified as priority estuary • Flow gauging probe installed • Data generated	If Wadrift identified as priority estuary	DWS, Department of Environment, Forestry and Fisheries (DEFF), BOfCMA

d.	Identify abstraction and discharge points – both legal and illegal – and implement compliance action against illegal operations	NWA	• Register of abstraction and discharge points compiled • Legal status determined • Illegal operations prosecuted	HIGH	Department of Environment, Forestry & Fisheries (DEFF), BOfCMA
e.	Develop and implement a water resource utilisation plan for surface and groundwater resources (including registration and licensing), for likely climate futures	NWA	• Utilisation plan developed • Number of licensed users • Regulated water use/abstraction	HIGH	DEFF, BOfCMA
f.	Monitor natural mouth dynamics (in partnership with DWS, CapeNature, neighbouring land owners and other Interested and Affected Parties (I&APs))	NWA (RDM)	• DWS to maintain water level recorder in system • Mouth state documented • Photographic database generated	MEDIUM	RMA
g.	Undertake artificial breaching in accordance with an approved Mouth Management Plan (MMP) and Maintenance Management Plan (MaintMP)	ICMA	• MMP approved • MaintMP developed and approved • Execution of science based artificial breaching / mouth manipulation (only if needed)	HIGH	RMA, Cederberg LM, DEA&DP
h.	Implement and document DEFF and DWS policy to not allow effluent discharge to the estuary (including Waste Water Treatment Works (WWTW), septic tanks, conservancy tanks, industrial & livestock effluent etc.)	NWA	• Discharge of effluent strictly prohibited • Upstream discharges monitored		RMA, DWS, DEFF, Cederberg LM
i.	Catchment water quantity and quality monitoring to be summarised and reported on	NWA	• Catchment strategy implemented • Annual report submitted to RMA and EAF	MEDIUM	DWS, BOfCMA, Cederberg LM
j.	Undertake seasonal (summer/winter) monitoring of fish and bird populations taking RQOs into account	NWA (RDM), National Environmental Management: Biodiversity Act (NEM:BA), Marine Living	• Species list and abundance data produced • Databases developed • Monitoring reports compiled and submitted • Data incorporated into EMP 5-year review	LOW	RMA (supported by e.g. GCBC, CapeNature, DST, CSIR)

		Resources Act (MLRA)			
k.	Identify and monitor sensitive species/ habitats of concern to assess ecosystem functionality, and develop appropriate guidelines	NWA (RDM)	• Sensitive species/ habitats identified • Status and trends of indicator species determined, taking climate change projections into consideration when selecting indicator species • Guidelines developed and implemented • Annual report submitted to DEFF and EAF	MEDIUM	GCBC, Cape Nature
l.	Monitor and report on the status of the estuary annually (inclusive of estuarine stresses and impacts)	NEM: BA	• Estuary impacts identified • Mitigation measures established • Climatic records obtained and analysed • Annual report submitted to DEFF and EAF • Data incorporated into EMP 5-year review	MEDIUM	RMA (supported by e.g. CapeNature, Department of Science and Technology (DST), Council for Scientific and Industrial Research (CSIR))
m.	Undertake full Resource Directed Measures (RDM) monitoring every 3 years	ICMA, NWA	• Required monitoring undertaken • Data produced and reported on • Data incorporated into EMP 5-year review	MEDIUM	DWS, BOfCMA, RMA (funding from Water Research Commission (WRC), DST)
Management Objective 1.2: Ensure estuary requirements are integrated into catchment processes to ensure healthy water quality					
a.	EMP included in catchment management strategy (CMS), and catchment classification systems and processes	NWA	• EMP integrated into the CMS • Estuary acknowledged as sensitive end-point	HIGH	BOfCMA
b.	Catchment land use map developed and updated annually	NWA, Conservation of Agricultural	• Updated land use map produced every year • Potential sources of pollution identified	MEDIUM	DALRRD (Land Care)

		Resources (CARA)			
c.	Land use and effluent management included in the CMS	NWA	• CMS reduces nutrient pollution from agricultural practises and identifies additional sources of pollution (land use and effluent) to the estuary and provides mitigation strategies	MEDIUM	BOfCMA
d.	Water use plan updated on an annual basis	NWA	• Updated water use plan produced every year, with reference to any changes in water availability due to climatic changes	MEDIUM	DWS (Resource protection)
e.	Municipal SDF and environmental overlay updated as and when required	Municipal Systems Act (MSA)	• Updated SDF and overlays produced	MEDIUM	Cederberg LM
Management Objective 1.3: Minimise pollution by addressing activities that lead to poor water quality					
a.	Undertake quarterly basic water quality monitoring	NWA	• Estuary WQ database maintained to facilitate long term database • Annual report compiled and provided to EAF • EMP informed by monitoring results going forward	HIGH	Cederberg LM
b.	Enforce agricultural best practice, specifically to reduce the application of inorganic fertilisers and sediment erosion from surrounding farms and catchment, and withdraw from EFZ (preferably setback)	NWA, CARA	• Engagement with famers in catchment initiated • Best practice methods promoted and implemented • No farming within EFZ • Improved water quality variables	HIGH	DALRRD,
c.	Regulate camping and provide waste disposal facilities to reduce litter left over from festive seasons	ICMA, National Environmental Management: Water Act	• Key public spaces / access points identified • Signage created and erected • Recovery of vegetation • Persistence of breeding birds • Duty of Care perception by public	HIGH	Cederberg LM, Land Owner

		(NEM: WA), MSA	• Appropriate preparation for peak periods • Clean-up operations undertaken after peak visitor periods		
Management Objective 1.4: Rehabilitate connectivity within the system					
a.	Identify and prioritise areas requiring rehabilitation	National Environmental Management Act (NEMA), NWA ICMA, Western Cape Transport & Infrastructure Act (WC TIA) (Act 1 of 2013)	• Priority areas identified • Methods investigated and rated	HIGH	RMA, DWS, DEFF
b.	Investigate methods to restore connectivity, including, but not limited to, redesign and modification to the Sishen railway bridge culverts and road all crossings			HIGH	RMA, Department of Transport (DoT), DWS, DEFF, Western Cape Department of Transport: Public Works (WC DoT&PW)
c.	Develop and implement a rehabilitation programme taking environmental impacts into account and including monitoring of results		• Connectivity rehabilitation programme developed • Corrective measures undertaken • Marine connectivity re-established • Monitoring undertaken to gauge success of intervention	HIGH	RMA, DoT, DWS, DEFF
d.	Install educational signage informing public of rehabilitation process		• Signage installed and maintained during and for an extended period after rehabilitation intervention	HIGH	RMA

Management Objective 1.5: Ensure sustainable resource use through an effective level of compliance management					
a.	Determine status of fish and bait stocks in Wadrift River estuary, including regular monitoring to determine recruitment patterns	MLRA	• Research undertaken • Data generated, and results reported on • Data incorporated into EMP 5-year review	LOW	DEFF (supported by e.g. CapeNature, DST, CSIR)
b.	Determine carrying capacity for fishing and bait harvesting	MLRA	• Carrying capacity determined for likely future climate states, and enforced	LOW	DEFF
c.	Assess, quantify and regulate extractive resource use activities on the estuary through relevant monitoring programmes (e.g. compliance patrols)	MLRA	• Monitoring programme developed and implemented • Monthly counts of number of harvesters • Increased patrols and monitoring conducted • Research projects commissioned • Reports submitted to DEFF (for information purposes)	LOW	CapeNature/DEFF,
d.	Deploy human resources for compliance and enforcement in respect to MLRA	MLRA	• Monitoring programme developed and implemented • Monthly counts of number of harvesters • Increased patrols and monitoring conducted • Research projects commissioned • Reports submitted to DEFF (for information purposes)	LOW	CapeNature/DEFF
e.	Informative signage, indicating zonation and allowable activities, to be placed at strategic points for all users/visitors	ICMA	• Key public spaces / access points identified • Signage created and erected	LOW	RMA

*Priority estuaries to be identified by DEF and DEA&DP and monitoring should be allocated accordingly.

5.2 Biodiversity Conservation

<u>Strategic Objective 2</u>: The biodiversity of the Wadrift River estuary is conserved.

Table 5: Management Objectives and Actions for Biodiversity Conservation

	Proposed Activity/Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 2.1: Ensure the conservation of representative estuarine habitats and indigenous species in accordance with a long-term view that recognises projected climate change					
a.	Adopt, implement and enforce spatial zonation plan	ICMA, Land Use Planning Act (LUPA)	• EFZ controls enforced and offenders prosecuted • Reduced illegal activities • Reduced habitat loss/degradation and disturbance, and inappropriate behaviour • Improved fish and invertebrate populations • Provision is made in spatial and development plans for biodiversity to adapt to a drier, hotter climate	MEDIUM	Cederberg Bay LM, Greater Cederberg Biodiversity Corridor (GCBC)
b.	Investigate special management area or other relevant conservation status as a bird sanctuary	NEM: PAA, ICMA	• Conservation methods investigated and implemented	MEDIUM	RMA, GCBC, CapeNature
c.	Keep a watching brief over the estuary in respect to bird disturbance (e.g. less nests, mortalities)	NEM:BA	• Basic monitoring undertaken • Key disturbance factors identified and reported on	MEDIUM	GCBC, Cape Nature
d.	Engage with landowners and stakeholders to encourage conservation environmental custodianship on adjacent properties.	NEMA (Duty of Care)	• Meeting with adjacent land owners convened • Signed agreements with land owners • Degraded areas rehabilitated • Degrading activities halted • Integrity of estuarine margin improved	MEDIUM	RMA, GCBC, CapeNature

5.3 Land-use and Infrastructure Planning and Development

<u>Strategic Objective 3</u>: Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised.

Table 6: Management Objectives and Actions for Land-use and Infrastructure Planning and Development

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Objective 3.1: Ensure appropriate and sustainable land use and coastal development in and around the Wadrift River estuary, considering ecosystem services					
a.	Implement coastal management line and associated development controls	ICMA, LUPA, MSA	• No further permanent development, infilling or land transformation in the EFZ (e.g. only new sacrificial infrastructure permitted) • Transgressors prosecuted • Corrective action undertaken • Reduced habitat loss/degradation and disturbance, and inappropriate behaviour	MEDIUM	Cederberg LM, WCDM, DEA&DP
b.	Adopt and incorporate the EMP and the spatial zonation plan into the municipal planning (SDF, schemes environmental overlay) and zoning.	MSA, LUPA, NEMA, ICMA	• EMP included in all relevant planning documents • Estuary considered no-go for development	MEDIUM	Cederberg LM
c.	Develop and publish estuarine bylaws or regulations to support spatial zonation	MSA, ICMA	• Bylaws developed and gazetted	LOW	Cederberg LM
d.	EFZ to be incorporated into all relevant government department planning documents and processes (e.g. Water Use License (WUL) Applications)	MSA, LUPA, NEMA, ICMA	• EMP included in all relevant planning documents	LOW	All authorities

e.	Use EAF as source of I&APs for Environmental Impact assessments (EIAs)	MSA, LUPA, ICMA, NEMA	• EAF partakes in development planning affecting the estuary • Impacts on the estuary are mitigated/prevented	LOW	RMA, Cederberg LM, WCDM, DEA&DP

5.4 Institutional and Management Structures

<u>Strategic Objective 4</u>: The Wadrift River estuary is well managed through effective co-operative governance.

Table 7: Management Objectives and Actions for Institutional and Management Structures

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 4.1: Ensure effective co-ordination of estuarine management responsibilities					
a.	Municipality adopts and incorporates the EMP and the spatial zonation plan into planning documents	MSA, LUPA, NEMA, ICMA	• EMP and zonation plan adopted by RMA • EMP included in all relevant planning documents	HIGH	RMA, Cederberg LM, WCDM
b.	Appoint District estuarine management co-ordinator/champion (EMC) within RMA	ICMA	• Estuarine management function established in RMA • EMC appointed	HIGH	RMA
c.	Undertake needs analysis and identify skills required	ICMA	• Needs and shortages identified • Motivation for acquisition drafted and approved • Equipment purchased and maintained	HIGH	RMA
d.	Implement skills development, training or co-opt additional members / secondment for estuarine management	ICMA	• Motivation for training drafted and approved • Staff attend relevant accredited training courses • Memorandum of Understanding (MOU) to be developed for secondments	HIGH	RMA
e.	Develop good communication protocols and processes with implementing agents (The RMA to develop working relationships with mandated department & agreements need to be developed to address each management action)	ICMA	• Project champions identified • Networks established, and contacts database compiled • Regular email correspondence	HIGH	RMA

f.	Ensure that EMP is maintained, enforced and budgeted for annually	ICMA, MSA, LUPA, NWA,	• An action plan for securing future funding drafted and approved • Funding secured for 5-year cycle	MEDIUM	All authorities
g.	Maintain/support a fully functional, regional EAF (or utilise other applicable forum) to facilitate co-operative governance	ICMA, MSA, LUPA, NWA, NEM: PAA, Mineral Resources and Petroleum Development Act (MRPDA)	• EAF constituted (Membership includes representatives of government and stakeholders/civil society) • Regional EAF meets on a quarterly basis • Meetings are minuted	HIGH	RMA
h.	Identify and invite missing stakeholders/ interest groups to partake in regional EAF	ICMA	• Networks established • Stakeholder database developed and regularly updated	MEDIUM	RMA
i.	RMA present on critical forums to ensure that estuarine issues are tabled, e.g. Catchment Management Agencies (CMA), Water Users Associations (WUA), Agriculture groups etc.	ICMA	• RMA attendance at critical forum meetings • Meetings are minuted	MEDIUM	RMA
j.	Maintain, monitor, review and report on the progress of EMP actions and achievements on annual basis	ICMA	• Feedback received from participating agencies • Biannual and annual reporting to EAF, DEA&DP, DEFF and, undertaken by RMA • Action plans updated as and when required	MEDIUM	RMA
k.	Undertake formal 5-year review as prescribed by the NEMP, with involvement of EAF	ICMA	• Motivation for updated drafted and approved • Funding confirmed • Terms of reference drafted • Consultants appointed • Plan updated	MEDIUM	RMA

Management Objective 4.2: Define co-operative governance arrangements					
a.	Identify and implement procedures to ensure cooperative governance between all gov. depts. with a mandate to act	ICMA, Inter-Governmental Relations Act (Act 13 of 2005)	• Roles and responsibilities defined and accepted via MOUs signed between RMA and spheres of government and participating agencies • Regional EAF meets on a quarterly basis • Meetings are minuted • Active collaboration of various implementing agents	HIGH	All authorities
b.	EAF to monitor performance of RMA irt implementation of plan	ICMA	• Authorities to provide formal feedback on mandated activities • Regional EAF meets on a quarterly basis	MEDIUM	All authorities, All stake-holders
c.	Individual agencies to identify and address training needs, with possible secondment to address training and capacity shortfalls	ICMA	• Motivation for training drafted and approved • Staff attend relevant accredited training courses • MOU to be developed for secondments	MEDIUM	All authorities
d.	Individual agencies to allocate resources, create and fill posts (including project champions), and acquire necessary infrastructure, resources and equipment of fulfil their mandates	MSA, NWA, ICMA, NEMA	• Need and Desirability investigation undertaken • Motivation for acquisition drafted and approved • Equipment purchased and maintained • Project champion(s) for allocated management actions • Staff appraisals in terms of management actions and projects (performance management system implemented)	MEDIUM	All authorities
e.	Mandated authorities and participating agencies to confirm budget allocations for mandated activities/actions	MSA, NWA, ICMA, NEMA	• Formal feedback from authorities on mandated activities • Motivation for budget drafted and approved • Funding secured for 5-year cycle	HIGH	All authorities

5.5 Education & Awareness

<u>Strategic Objective 5</u>: Members of society are sensitive to, and aware of, the value and importance of the Wadrift River estuary.

Table 8: Management Objectives and Actions for Education & Awareness

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 5.1: Promote high levels of public awareness and appreciation of the value of estuaries					
a.	Develop and effective education and awareness programme for local farmers, residents and visitors	ICMA	• Education & awareness programme developed and implemented at schools and through interest groups • Increased educational opportunities at group gatherings, community meetings, conferences etc.	LOW	RMA, GCBC,
b.	Source and/or commission educational and informative material including signage, posters, and pamphlets	ICMA	• Signage created, and erected Posters and pamphlets erected/ disseminated • General coastal management and climate change information included in awareness materials • Cederberg estuaries webpage operational	LOW	RMA, GCBC,

5.6 Disaster Risk Management

<u>Strategic Objective 6:</u> Potential risks that could impact the Wadrift River estuary are reduced (inclusive of climate change impacts).

Table 9: Management Objectives and Actions for Disaster Risk Management

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 6.1: Disaster prevention, preparedness and mitigation					
a.	Ensure that all proposed developments adhere to the full suite of relevant environmental legislation, particularly the coastal management line and associated development controls	NEMA, ICMA, etc.	• All developments comply with environmental legislation and environmental best practice / risk aversion approach • No permanent development, infilling or land transformation of EFZ • Transgressors prosecuted • Corrective action undertaken • Reduced risk of degradation, transformation and disturbance to the estuary	HIGH	Cederberg LM, RMA, DEA&DP
b.	Identify, prioritise, estimate costs, and rehabilitate vulnerable areas (e.g. bank erosion, disturbed riparian vegetation)	NEMA, WC TIA	• Priority areas needing rehabilitation identified • Degradation profiles compiled • Rehabilitation programme developed • Priority degraded areas restored	MEDIUM	WC DoT&PW, Cederberg LM, RMA
c.	Identify areas and infrastructure at risk of flooding and erosion, and include in relevant plans (specifically regional disaster management plan)	Disaster Management Act (Act 57 of 2002) (DMA), WC TIA	• High risks and risk areas identified • Relevant plans updated with early warning and monitoring systems, and contingency plans for high erosion and flood risk areas, as well as extreme heat and drought events. • Disaster management plan implemented	MEDIUM	RMA, WC DoT&PW, WC Department of Local Government: Disaster Management Cederberg LM

d.	Develop and implement contingency plans to address specific sources of pollution (oil spill, chemical spill and other industrial/ toxic substances.)	NWA, ICMA, DMA	• Identify specific sources of pollution in addition to industrial input • Contingency plans developed and approved • Contingency plan to include a health incident evacuation plan, identifying actions, timing and responsible agencies and actors. • Mitigation / clean-up undertaken • Investigation initiated, and enforcement actions undertaken	MEDIUM	RMA, Cederberg LM, DWS, DEFF, WC Dept of Local Gov: Disaster Management
e.	Enforce the 'Polluter pays' principle and timeous and appropriate rehabilitation of damaged areas	NEMA	• Transgressors prosecuted • Corrective action undertaken and degraded areas rehabilitated	MEDIUM	Cederberg LM, DEA&DP

6 PROPOSED SPATIAL ZONATION

6.1 Introduction

The spatial zonation of activities on an estuary is necessary to avoid user conflict and to guide sustainable utilization without degradation of the estuarine environment. The spatial zonation plan provides a means of geographically transposing the aims of the management objectives, where applicable, and is typically informed by the following (DEA, 2015):

- The geographical boundary of the estuary also indicating important habitats (e.g. floodplain, open water, reed beds, sandflats, etc.);
- The surrounding land uses and existing infrastructure;
- Areas designated for the conservation and protection of biodiversity;
- Appropriate buffers in which land use and development are strictly controlled and monitored; and
- Zones where certain types of activities (recreational, commercial, industrial, harvesting etc.) are permissible and others not permissible.

6.2 Habitat zones

A habitat sensitivity analysis is the baseline which guides the differentiation of the various zones, specifically identifying:

- threatened, ecologically important habitats as no-go or minimal disturbance zones;
- those areas which can support controlled, sustainable exploitation of marine living resources; and
- those where various forms and levels of appropriate water-based recreation are acceptable.

The habitat map shown in Figure 6 is used as the baseline for the identification of sensitive estuarine habitats.

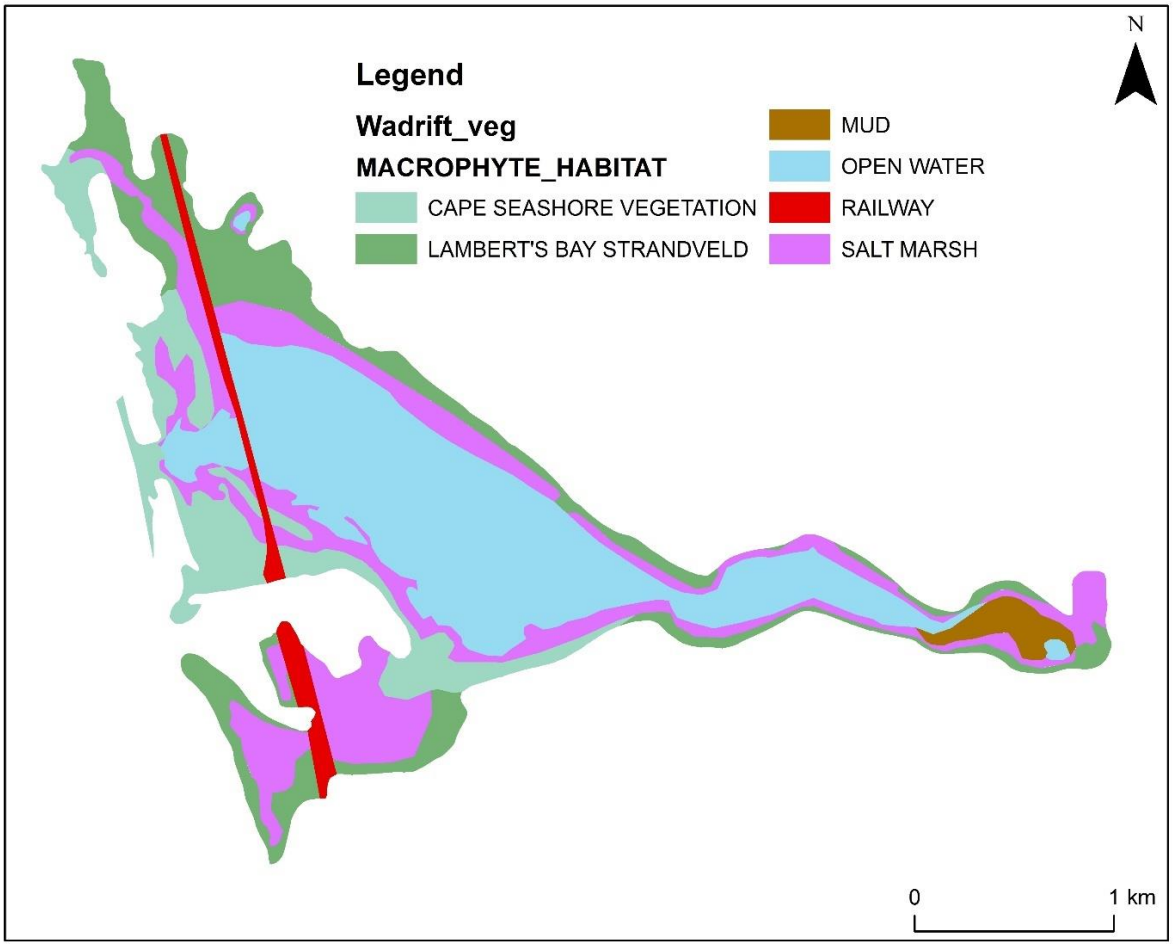

Figure 6: Habitats identified in the Wadrift River estuary (based on 2013 aerial imagery)

6.3 Legislated Coastal Boundaries and Buffer Zones

6.3.1 Estuarine Functional Zone

The ICMA defines an estuary as "*a body of surface water -*

a) that is permanently or periodically open to the sea;
b) in which a rise and fall of the water level as a result of the tides is measurable at spring tides when the body of surface water is open to the sea; or
c) in respect of which the salinity is higher than fresh water as a result of the influence of the sea, and where there is a salinity gradient between the tidal reach and the mouth of the body of surface water".

Similarly, the National Water Act (NWA) defines an estuary as "*a partially or fully enclosed water body that is open to the sea permanently or periodically, and within which the seawater can be diluted, to an extent that is measurable, with freshwater drained from land*".

However, the 2018 National Biodiversity Assessment provides a more detailed definition of an estuary, that is: "a partially enclosed permanent water body, either continuously

or periodically open to the sea on decadal time scales, extending as far as the upper limit of tidal action, salinity penetration or back-flooding under closed mouth conditions. During floods an estuary can become a river mouth with no seawater entering the formerly estuarine area or, when there is little or no fluvial input, an estuary can be isolated from the sea by a sandbar and become fresh or even hypersaline" (SANBI 2019).

The EFZ is defined by the 2014 Environmental Impact Assessment (EIA) Regulations (as amended in 2017) (GN 324) as "*the area in and around an estuary which includes the open water area, estuarine habitat (such as sand and mudflats, rock and plant communities) and the surrounding floodplain area, as defined by the 5 m topographical contour (referenced from the indicative mean sea level)*". The NEMP acknowledges the EFZ as the geographical boundary of estuaries in South Africa. In practice, it is found that the 5 m topographic contour approximates the EFZ for most estuaries in South Africa. It is consequently commonly used to delineate the EFZ in the absence of specific biophysical assessments. Where biophysical information is available, the EFZ can be delineated according to the presence of estuarine vegetation or features such as wetlands that are directly supportive of the estuary. This approach informed the EFZ used in the 2018 NBA (SANBI, 2019) (refer to Figure 3).

6.3.2 Coastal Protection Zone and proposed Coastal Management Line

The Integrated Coastal Management (ICM) Act defines a default **Coastal Protection Zone (CPZ)** which, in essence, consists of a continuous strip of land, starting from the High Water Mark (HWM) and extending 100 m inland in developed urban areas zoned as residential, commercial, or public open space, or 1 000 m inland in areas that remain undeveloped or that are commonly referred to as rural areas. It also includes certain sensitive or at-risk land such as estuaries, littoral active zones and protected areas.

The Provincial Member of the Executive Council (MEC), in consultation with the Local Municipalities, is required to refine and formally adopt the CPZ. A process is currently underway to formally establish a CPZ for the Western Cape Coastline. In accordance with provisional delineation of the CPZ for estuaries in the West Coast, as per draft delineations recommended in the Coastal Set-back / Management Lines for the West Coast District project (WCG, 2015), the CPZ is informed by a coastal risks zone approximated by the **10 m Above Mean Sea Level (amsl) contour or 1:100yr floodline** around an estuary, whichever is wider.

The ICMA also provides for the establishment of a **Coastal Management Line (CML)**, designed to limit development in ecologically sensitive or vulnerable areas, or an area where dynamic natural processes pose a hazard or risk to humans. A CML, as envisaged by the amended ICM Act, is informed by the projections of risk emanating from dynamic coastal processes such as sea level rise or erosion, information on ecological or other sensitivities adjacent to the coast, as well as the location and extent of existing development and existing executable development rights. The CML is a continuous line, seawards of which lies:

- Areas of biophysical or social sensitivities such as sensitive coastal vegetation identified as priority conservation areas and formal protected areas;
- those areas that should be left undeveloped, or only be granted appropriately restricted development rights, due to a high risk from dynamic coastal processes; or
- coastal public property.

In estuaries, the CML is delineated by the 5 m amsl contour or 1:100yr floodline, whichever is wider, to differentiate a zone where formal development should be discouraged. The coastal boundaries for the Wadrift River estuary are illustrated in **Figure 7**.

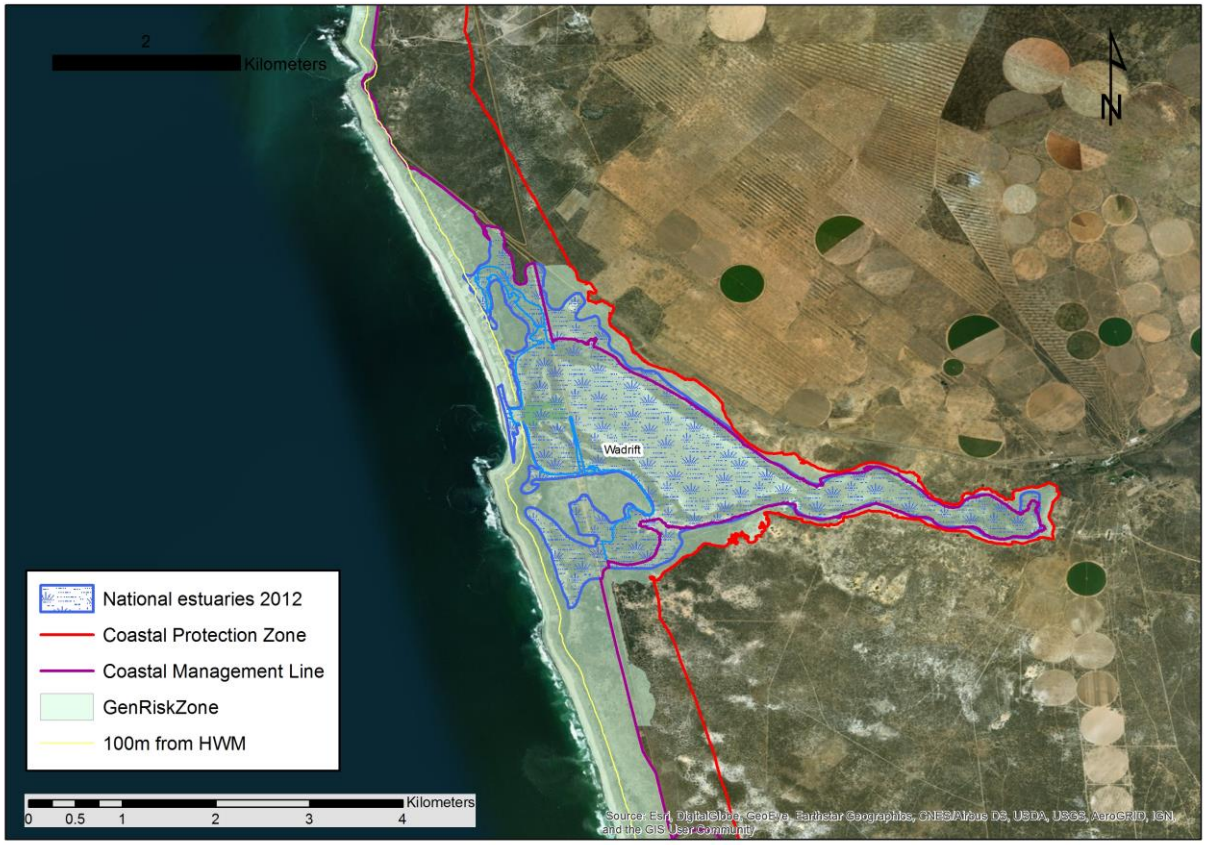

Figure 7: Coastal boundaries of the Wadrift River estuary and risk projections (WCG, 2015)

6.3.3 Environmental Impact Assessment regulatory line

In respect of the EIA regulatory scheme, an additional line called the Development Set-Back Line (DSL) needs to be differentiated as it relates to the 'development set-back' referred to in the EIA regulations[2] rather than the coastal management lines described in the ICM Act. However, as part of the on-going process of defining coastal

[2] The Environmental Impact Assessment Regulations, 2014 (as amended in 2017), published under Government Notice No. 326 in Gazette No. 40772 of 4 April 2017, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)

management lines for the Western Cape, it is currently **proposed that the CML, as defined under ICMA, also be used as the DSL**.

Reference to development set-backs is found in the EIA Listing Notices that list a range of activities that require different levels of environmental impact assessment and the issuing of an environmental authorisation prior to being undertaken.

Typically, an activity would be listed in the form of a range of thresholds which, if exceeded, trigger the need for an environmental impact assessment in the form of a Basic Assessment or EIA. In some cases, however, a development set-back line is used as spatial reference to include or exclude activities. The EIA regulations indicate that: "*development setback" means a setback line defined or adopted by the competent authority*". This implies that if such a setback is defined, the setback delineation replaces the default parameters for an activity, as read within the context of that activity. The competent authority in the Western Cape is DEA&DP or the National DEFF.

The EIA regulations also refer to whether a development is in front or behind the line – for a coastal development set-back this equates to any development seaward of the line being 'in front of', whilst landward of the line being 'behind'.

An important further point to note is that the development set-backs are usually linked to the presence of urban built-up areas. The regulations indicate that ""*urban areas" means areas situated within the urban edge (as defined or adopted by the competent authority), or in instances where no urban edge or boundary has been defined or adopted, it refers to areas situated within the edge of built-up areas*". These exclusion areas create *de facto* islands in the area below the DSL, within which the specifically excluded EIA triggers don't apply.

The Western Cape Government, as designated competent authority, considers the area below/seaward of existing development as falling outside of the 'built-up area'. Therefore, any exclusions based on a listed activity taking place within the built-up area would not apply to this strip of coastal land, and the prescriptions for environmental assessments related to the particular activity will apply. For example, the beach in front of seafront houses is not considered 'built-up' and environmental authorisations will be required to execute any listed activities on that beach.

6.4 Zonation of Activities

6.4.1 Current zonations and uses

The table below lists the surrounding land use types as per the Cederberg Municipal town planning scheme regulations (Cederberg LM, 1986) and activities occurring in and/or adjacent to the Wadrift River estuary (Table 10). It is noted that the scheme is

currently being reviewed and updated and proposed to be implemented in mid-2019 (A Neethling[3], pers. comm).

Table 10: Current zonations and activities occurring in and/or adjacent to the Wadrift River estuary

LAND USE	DESCRIPTION
Agriculture Zone 1: Agriculture	The whole vlei is located on land zoned as Agriculture on the farm called Wagon Drift.
ACTIVITIES	**DESCRIPTION**
Farming, abstraction of water	Abstraction activities for irrigating potato crops
Recreational activities	Numerous vehicle tracks over dry vlei areas (illegal driving in the coastal zone), birding particularly when the vlei contains more water, camping in the vicinity of the mouth

The Cederberg Spatial Development Framework (Cederberg LM, 2017), while not specifically detailing the agricultural areas on which the Wadrift River estuary is located, excludes the area from its urban edge due to its omission from relevant plans. No additional development or urban expansion is therefore proposed adjacent to the system. Further to this, input received from stakeholder engagement[4] indicates that the Cederberg Municipality proposes to amend the current agriculture/undetermined zoning of the estuary to an environmental zoning.

6.4.2 Proposed spatial zonation

Despite its degraded state, the Wadrift River estuary is classified as a Critical Biodiversity Area, with its various supporting ecological habitats, because it plays a critical role in providing very limited wetland-type habitat for estuarine and coastal birds along the arid west coast. Acknowledging the regional functional and biodiversity value of the system, it is proposed that the entire EFZ be designated as a conservancy and included in the CapeNature stewardship programme.

A conservancy is "*a voluntary agreement between two or more landowners to cooperate towards the conservation of the environment on their combined properties*" (CapeNature, 2016). In this regard, both landowners and activities on their properties, e.g. Sishen Railway, cultivation or livestock grazing etc., need to work continuously toward the greater good of preserving the Wadrift River estuary, uplifting the health and biodiversity of the system, and preventing, minimising, and mitigating negative impacts.

As a conservancy, limited activities are encouraged in the EFZ, and these activities are directed toward accessing and appreciating nature. The primary purpose of this zone is to manage and direct low impact use and interaction so as to minimise impacts on

[3] Adriaan Neethling, Town Planner, Cederberg Local Municipality, 1 November 2018

[4] Minutes of the Second Stakeholder meeting for the Jakkalsvlei and Wadriftvlei estuarine systems, Wednesday 6th of November, 2018, Lamberts Bay Library, Lamberts Bay.

the coastal environment. Allowable activities in these zones are to be managed as per Table 11 below.

Formal development or construction activities in this zone are to be regulated according to the EIA Regulations and any future controls emanating from the Provincial determination of coastal management lines.

Table 11: Zonation prescriptions for the Wadrift River estuary

ZONE/USE	CONDITIONS OF USE	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY	ENFORCEMENT
Agriculture, Conservancy	• Guided or unguided nature observation. • Day hiking trails and/or short trails. • Bird hides, canoeing, mountain biking & rock-climbing where appropriate and if there is enough water. • No special access control or permits required. • Pedestrian access along designated routes. • Vehicular access along designated routes only • No accommodation or camping. • Frequent interaction with other users. • On water – only non-motorised craft permitted (e.g. canoeing), unless specifically noted.	NEM: PAA	Cederberg LM / CapeNature	Cederberg LM / CapeNature

6.4.3 Areas requiring rehabilitation

In order to improve and maintain the present ecological state of the Wadrift River estuary from a Category E to the REC of D[5], significant interventions are required in the catchment and in the estuary, namely:

- Maintaining good water quality conditions in the catchment through strict management of agricultural return flows;
- Maintaining /increasing baseflows to estuary, specifically through limiting water resource development activities within the catchment; and
- Re-design of the culverts under both the Transnet service road and Sishen railway line to allow for connectivity.

Rehabilitation of the catchment area is critical as the recommended ecological category of the Langvlei River feeding into the Wadrift River estuary is a category C.

[5] However it is noted that the 2018 NBA (SANBI 2019) suggests a Category E

7 INTEGRATED MONITORING PLAN

According to the standards for estuarine management, management actions should be based on sound scientific evidence. Thus, monitoring is a crucial aspect of the adaptive estuarine management planning process as the generated data will be used to inform and update management decisions. However, the collection, processing and interpretation of such data, particularly ecological data, are generally costly and time-consuming and often require considerable scientific expertise.

In the context of estuarine management, there are three broad categories of monitoring which should be incorporated into an integrated monitoring plan, namely resource monitoring, compliance monitoring and performance monitoring (DEA, 2015). These components are discussed in the following sections.

7.1 Resource Monitoring

7.1.1 Current Resource Monitoring

Current resource monitoring includes:

- Water level: The current DWS water level recorder within the Wadrift water body is not functional due to the exceedingly low water levels (Figure 8); and
- Birds: Biannual counts of the bird populations are undertaken by CapeNature as part of the CWAC. It is imperative that this monitoring continues.

Figure 8: Wadriftvlei with the DWS water level recorder

7.1.2 Recommended Resource Monitoring Programmes

In the context of the Wadrift River estuary, general baseline information is limited or lacking. The recommended minimum monitoring requirements to ascertain impacts of changes in freshwater flow, and current and future impacts on the estuary and/or any improvement or reductions therein are listed in Table 12 (Appendix 1). In respect to improving baseline information, the proposed monitoring requirements must also be implemented in the event of a breaching event, and quarterly for 2 years thereafter (apart from those items identified as requiring continuous monitoring). Recommended baseline monitoring requirements to improve the confidence of future water requirement assessments are listed in Table 13 (Appendix 1).

A basic monitoring programme should be established by the RMA for the Wadrift River estuary according to the Reserve Determination methods. The programme should seek to address the monitoring priorities as soon as possible and various components can be monitored by the Greater Cederberg Biodiversity Corridor.

7.1.3 Resource Quality Objectives

Resource Quality Objectives (RQOs) are clear and measurable specifications of ecological attributes (in the case of estuaries - hydrodynamics, sediment dynamics, water quality and different biotic components) that define a specific ecological category.

The Wadrift SAR indicates a category D. However, is noted that the 2018 NBA (SANBI, 2019) suggests a Category E and the 2013 Reserve Determination study recommends a Category C (DWA, 2013). The associated RQOs for the latter are presented in Table 14 (Appendix 2) for ease of reference (DWA, 2013).

In addition, the 2013 Reserve Determination study makes reference to the Wadrift Wetland - a small wetland at the point of discharge of the Langvlei River onto the coastal plain, immediately upstream of and grading into the Wadrift Pan (estuary) (DWS, 2013). The study recommends a REC of C for the wetland and the RQOs are provided in Table 15 (Appendix 2).

7.2 Compliance Monitoring

Compliance monitoring refers to the monitoring of the character and intensity of uses/activities and developments within an estuary/EFZ. Such monitoring is usually prescribed in relevant legislation, regulations, policies, standards, guidelines and or permits and license agreements (DEA, 2015). The purpose of this form of monitoring is to test whether activities are compliant with the established limits and objectives as well as to detect growing pressures on resources.

Currently there is no compliance monitoring taking place on the Wadrift River estuary.

In respect to the implementation of this EMP, compliance monitoring will be the responsibility of the DALRRD in terms of agricultural best practise and DWS for water abstractions and will be undertaken according to legislation and policies applicable and by means of law enforcement and compliance monitoring protocols. Compliance in respect to illegal driving in the coastal zone is the mandate of DEFF.

7.3 Performance Monitoring (Review & Evaluation)

A performance monitoring plan is used by the RMA, and/or identified implementing agents, to assess the effectiveness with which planned management activities contained in the EMP are being performed and ultimately to gauge progress in achieving the vision and objectives. This component utilises the performance indicators included for the various actions, specifically the management priorities, and includes a temporal scale or the frequency of the collection of the performance data and the targets that should be achieved.

Ultimately the EMP must be holistically reviewed every 5 years from the date it was adopted, ideally in line with the review cycles of the applicable IDP, SDF and/or CMP. This review is the responsibility of the RMA. According to the NEMP, this review should include an assessment of:

- The effectiveness of the EMP and success with meeting the objectives (i.e. the performance monitoring plan);
- Environmental changes at a local or a wider scale that could affect the estuarine resources or the implementation of the EMP; and
- Changes (if any) to legislation, land-use planning, goals or policies that may require the EMP to be amended.

This review may involve revisiting the SAR to determine the progress or changes that have come about because of the EMP in terms of the objectives that were originally set. It may also require the EMP to be amended, including a revision of the objectives, amendments to the management actions, and/or monitoring protocols. Ideally, representatives and experts in the major sectors (e.g. water quantity and quality, land-use and infrastructure planning and development), should evaluate the efficiency of the EMP in the context of their mandate or area of expertise. Public participation will be required before the amended EMP can be approved.

A performance monitoring plan relative to the proposed management priorities in included as Table 16 at Appendix 3.

8 INSTITUTIONAL CAPACITY & ARRANGEMENTS

It is essential that this EMP is regarded as a strategic plan that can guide the detailing of management actions and identification of implementing agents. Therefore, it does not specify the required resources (human and financial) required for effective management of the estuary. It does, however, offer a schedule or phased planning approach that incorporates capacity building and implementation at the local level over a five-year period. It is crucial that champions/project leaders/teams are identified who will be responsible for the formulation of detailed project plans and the implementation thereof.

8.1 Key Role Players

Co-management and effective governance have been identified as vital aspects of efficient and effective estuarine management. Figure 9 displays the key role players that should be included in its management.

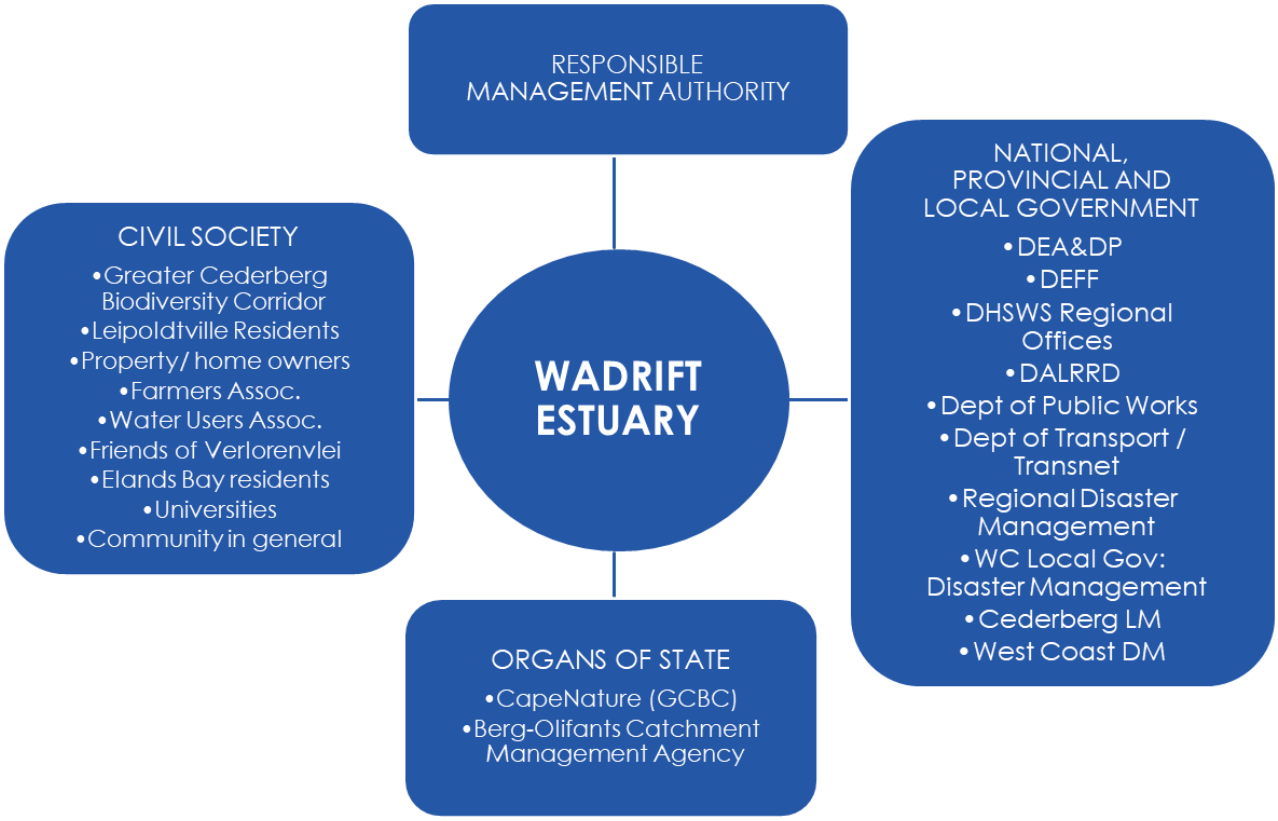

Figure 9: Key role players for the management of the Wadrift estuarine system

8.2 Responsible Management Authority

The 2021 NEMP identifies the **Department of Environmental Affairs & Development Planning (DEA&DP)** (**provincial environmental department)**, or its assigned representative, as the RMA responsible for the co-ordination of the implementation of the Wadrift River Estuary EMP. **It**

is noted that the NEMP allocates such responsibilities to the DEA&DP (provincial environmental department) unless agreement / or until agreement is reached with the respective body to undertake the coordination of the implementation process. Ultimately, the role of the RMA must be designated through formal signed agreement..

The Wadrift River estuary also falls within the Greater Cederberg Biodiversity Corridor, under the auspices of CapeNature. Thus, management of the Wadrift River estuary may benefit from a joint agreement (or delegation).

Specific implementation actions identified in this EMP remain the responsibility of mandated government agencies as well as respective departments within the RMA. As an example, the DWS will monitor water quality, while the DALRRD will be responsible for agriculture related issues. It is crucial that champions/project leaders/teams are identified who will be responsible for the formulation of detailed project plans and the implementation thereof.

Effective implementation of this EMP requires the augmentation of capacity specifically within DEA&DP, with the recommended appointment of a District Estuarine Management Co-ordinator (EMC). This individual will play a critical co-ordinating role for all other implementing agencies.

Progress towards achieving the objectives set out in this EMP should be reviewed on an annual basis by the RMA and communicated to stakeholders and the DEFF via an annual report. This EMP will need to be revisited and updated after five years to reflect goals that have been achieved and to accommodate changing priorities.

8.3 Estuary Advisory Forum

While the establishment of an EAF for each estuary is no longer a requirement in the NEMP, the Western Cape Government still support their establishment and recommend that private entities and non-government organisations continue to play a supporting role in the implementation of this EMP. While an individual EAF is not recommended, the establishment of a regional EAF is proposed, incorporating the Jakkalsvlei, Wadrift and Verlorenvlei estuarine systems. The EAF should be chaired by the RMA and should aim to meet on a quarterly basis.

Government departments should be represented on this regional EAF by delegates mandated by the respective department to do so. Each government representative on the EAF will be tasked to convey recommendations to his/her department and report back to the EAF on behalf of the department. Moreover, representatives from the authority/ies who have executive powers within the specific sector should also be present. This ensures that recommendations are executed, and resources are made available for priority tasks or activities. This also streamlines the flow of information and decreases the turnaround time of required interventions.

The various local members of the EAF will play an invaluable role in providing on the ground, local insight and support to the various authorities as well as to the RMA. For example, the GCBC can potentially assist with ongoing basic monitoring of the system.

8.4 Government Departments and Organs of State

The key to successful implementation of this EMP is the commitment and contribution of all spheres of government to the process, including:

- The identified RMA (DEA&DP, Cape Nature or the Cederberg Local Municipality);
- The Cederberg Local Municipality;
- The West Coast District Municipality: Responsible for issues relating to water and sanitation, disaster management as well as the provision of management and technical support;
- Western Cape Government departments: Responsible for legislatively mandated responsibilities as well as support, including compliance, funding, research and monitoring (e.g. DEA&DP, WC DoT&PW);
- Relevant National government departments, especially DEFF, DWS (via the regional office), DALRRD, Department of Mineral Resources, DoT, DST; and
- Organs of State: CapeNature, CSIR, and BOfCMA.

A crucial element towards achieving the vision and objectives of this plan, now and in future, is to ensure that the responsible authorities and their constituent departments, fulfil their roles and responsibilities as identified within the EMP. In terms of practical implementation of the EMP, each responsible government department is required to produce internal project plans linked the identified management actions, and in line with their legislative mandates. Funding and staff resources will need to be sourced within each respective sector department and/or institute. Alternatively, departments may fund other entities to undertake their necessary functions on their behalf.

The DEFF is generally responsible for national standardisation of estuarine management and approval of provincially-compiled estuarine management plans. Direct involvement in individual estuaries will occur via existing forums for intergovernmental coordination. These forums will have the estuarine management on their agendas, and include:

- The West Coast Municipal Coastal Committee: Responsible for facilitating co-management, effective governance and district level co-ordination of coastal and estuarine management issues;
- Western Cape Provincial Coastal Committee: Responsible for facilitating co-management and effective governance and provincial co-ordination of estuarine management; and
- The Western Cape Estuaries Task Team: Responsible for facilitating provincial co-ordination of estuarine management.

8.4.1 Project Plans for Implementation

Effective implementation of this EMP requires the conversion of the priority actions into detailed project plans, which must be prepared and adopted into the respective departmental implementation strategies. A template for such project plans is provided in the EMP Development Guideline (DEA, 2015) and is attached as Appendix 4 for ease of reference. This template can also be utilised to facilitate the implementation of other projects proposed in the EMP.

9 RECOMMENDATIONS AND CONCLUSION

The following items/issues are considered critical towards the ultimate achievement of the vision and should be immediately addressed and/or receive greatest effort in respect to human/financial resources:

- Legal water abstraction and agricultural best practice must be enforced;
- Conservation environmental custodianship by landowner encouraged and entire EFZ designated as a conservancy and included in the CapeNature stewardship programme;
- Appeal must be made for the redesign of the culverts under both the Transnet service road and Sishen railway line to allow for connectivity; and
- The DEA&DP to consider the appointment of a Regional estuarine management co-ordinator/champion within either DEA&DP or CapeNature, to support the RMA.

In conclusion, this plan adopts the principle of adaptive management and presents an integrated and holistic approach to addressing not just the impacts but also the social and economic drivers that affect estuarine health. The actions proposed in this EMP reflect an ongoing process of implementation and should accommodate potential amendment due to changing circumstances. They are the first steps of a long-term process designed to secure ongoing and sustainable improvements to the current situation.

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APPENDIX 1: RECOMMENDED MONITORING PROGRAMMES

Table 12: Recommended minimum requirements for long-term monitoring (Priority: Red = High; Orange = Medium, Yellow = Low) (based on DWS, 2017)

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
Hydro-dynamics	Record estuary water levels.	Continuous	In main water body	
	Measure groundwater level.	Continuous	Near head of estuary	
	Satellite photographs of estuary (30 x 30 m).	Every 3 years	Entire estuary	
Sediment dynamics	Bathymetric surveys: Series of cross-section profiles and a longitudinal profile collected at fixed 100-200 m intervals, but in more detail in the mouth. The vertical accuracy should be about 5 cm.	Every 3 years	Entire estuary	
	Set sediment grab samples (at cross section profiles) for analysis of Particle Size Distribution (PSD) and origin (i.e. using microscopic observations).	Every 3 years (with invert sampling)	Entire estuary	
Water quality	Water quality (e.g. system variables (e.g. pH, oxygen, turbidity), nutrients and toxic substances) measurements in the surface and groundwater entering the head of the estuary.	Monthly continuous	Close proximity to head of estuary	
	In situ salinity and temperature observations.	Continuous	In main water body (1 to 3 stations)	
	Longitudinal salinity and temperature profiles (in situ) collected over a spring and neap tide during high and low tide at: End of low flow season (i.e. period of maximum seawater intrusion). Peak of high flow season (i.e. period of maximum flushing by river water).	Every year at end of dry season	Entire estuary (3-5 stations)	
	Water quality measurements (i.e. system variables, and nutrients) taken along the length of the estuary (surface and bottom samples).	Seasonal surveys, every 3 years	Entire estuary (3-5 stations)	
	Measurements of organic content and toxic substances (e.g. trace metals and hydrocarbons) in sediments along length of the estuary, where considered an issue.	Every 6 years	Focus on sheltered, depositional areas	
	Water quality (e.g. system variables, nutrients and toxic substances) measurements on near-shore seawater.	Use available literature	Seawater adjacent to estuary mouth at salinity 35	

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
Microalgae	Record relative abundance of dominant phytoplankton groups, i.e. flagellates, dinoflagellates, diatoms and blue-green algae.	Summer survey every 3 years	Entire estuary	
	Chlorophyll-a measurements taken at the surface, 0.5 m and 1 m depths, under typically high and low flow conditions using a recognised technique, e.g. HPLC.	Summer survey every 3 years	Entire estuary	
	Intertidal and subtidal benthic chlorophyll-a measurements.	Summer survey every 3 years	Entire estuary	
Macrophytes	Ground-truthed maps to document changes in macrophyte habitats over time. Document area covered by sensitive habitats i.e. submerged macrophytes.	Summer survey every 3 years	Entire estuary	
	Record number of macrophyte habitats, identification and total number of macrophyte species, number of rare or endangered species or those with limited populations documented during a field visit.	Summer survey every 3 years	Entire estuary	
	Note extent of macroalgal blooms, floating aquatic macrophytes and area occupied by invasive vegetation.	Summer survey every 3 years	Entire estuary	
	Take measurements of depth to water table	Summer survey every 3 years	Upper reaches	
Invertebrates	Record species and abundance of zooplankton, based on samples collected across the estuary.	Summer survey every 3 years	Entire estuary (3-5 stations)	
	Record benthic invertebrate species and abundance, based on subtidal and intertidal grab samples at a series of stations up the estuary, and counts of hole densities.	Summer survey every 3 years	Entire estuary (3-5 stations)	
	Measures of sediment characteristics at each station.	Summer survey every 3 years	Entire estuary (3-5 stations)	
Fish	Record species and abundance of fish, based on seine net sampling.	Summer survey every 3 years	Entire estuary (3-5 stations)	
Birds	Undertake counts of all water associated birds, identified to species level.	Annual winter (Jul/Aug) and summer (Jan/Feb) surveys	Entire estuary	

Table 13: Recommended baseline monitoring requirements to improve the confidence of future EWR assessments (Priority: Red = High; Orange = Medium, Yellow = Low, White = Not relevant) (based on DWS, 2017)

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
Hydro-dynamics	Record estuary water levels.	Continuous	In main water body	
	Measure groundwater level.	Continuous	Near head of estuary	
	Satellite photographs of estuary (30x 30 m).	Once off	Entire estuary	
Sediment dynamics	Bathymetric surveys: Series of cross-section profiles and a longitudinal profile collected at fixed 100-200 m intervals, but in more detail in the mouth. The vertical accuracy should be about 5 cm.	Once off (or in the case of a flood)	Entire estuary	
	Set sediment grab samples (at cross section profiles) for analysis of Particle Size Distribution (PSD) and origin (i.e. using microscopic observations).	Once off (with invert sampling)	Entire estuary	
Water quality	Water quality (e.g. system variables (e.g. pH, oxygen, turbidity), nutrients and toxic substances) measurements in Groundwater entering the head of the estuary.	Breaching event, then quarterly for 2 years	Close proximity to head of estuary	
	In situ salinity and temperature observations.	Continuous	In main water body (1 to 3 stations)	
	Longitudinal salinity and temperature profiles (in situ) collected over a spring and neap tide during high and low tide at: End of low flow season (i.e. period of maximum seawater intrusion). Peak of high flow season (i.e. period of maximum flushing by river water).	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	
	Water quality measurements (i.e. system variables, and nutrients) taken along the length of the estuary (surface and bottom samples).	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	
	Measurements of organic content and toxic substances (e.g. trace metals and hydrocarbons) in sediments along length of the estuary, where considered an issue.	Breaching event, then quarterly for 2 years	Focus on sheltered, depositional areas	
	Water quality (e.g. system variables, nutrients and toxic substances) measurements on near-shore seawater.	Use available literature	Seawater adjacent to estuary mouth at salinity 35	
Microalgae	Record relative abundance of dominant phytoplankton groups, i.e. flagellates, dinoflagellates, diatoms and blue-green algae.	Breaching event, then quarterly for 2 years	Entire estuary	
	Chlorophyll-a measurements taken at the surface, 0.5 m and 1 m depths, under typically high and low flow conditions using a recognised technique, e.g. HPLC.	Breaching event, then quarterly for 2 years	Entire estuary	

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
	Intertidal and subtidal benthic chlorophyll-a measurements.	Breaching event, then quarterly for 2 years	Entire estuary	
Macrophytes	Ground-truthed maps to document changes in macrophyte habitats over time. Document area covered by sensitive habitats i.e. submedged macrophytes.	Breaching event, then quarterly for 2 years	Entire estuary	
	Record number of macrophyte habitats, identification and total number of macrophyte species, number of rare or endangered species or those with limited populations documented during a field visit.	Breaching event, then quarterly for 2 years	Entire estuary	
	Note extent of macroalgal blooms, floating aquatic macrophytes and area occupied by invasive vegetation.	Breaching event, then quarterly for 2 years	Entire estuary	
Invertebrates	Record species and abundance of zooplankton, based on samples collected across the estuary.	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	
	Record benthic invertebrate species and abundance, based on subtidal and intertidal grab samples at a series of stations up the estuary, and counts of hole densities.	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	
	Measures of sediment characteristics at each station.	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	
Fish	Record species and abundance of fish, based on seine net sampling.	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	
Birds	Undertake counts of all water associated birds, identified to species level.	Breaching event, then quarterly for 2 years	Entire estuary	

APPENDIX 2: RESOURCE QUALITY OBJECTIVES

The Wadrift Wetland is a small wetland at the point of discharge of the Langvlei River onto the coastal plain, immediately upstream of and grading into the Wadrift Pan (estuary) (DWS, 2013).

Table 14: Water level and inundation RQOs for the Wadrift Pan (estuary) (Category ≥C) (DWA, 2013)

ECOLOGICAL COMPONENT	RQOs	
Hydrology and Hydrodynamics	• Flows shall be sufficient to maintain the Wadrif wetlands and saltpan (estuary) in an ecological condition that is equal to C Category	
	Volume requirement	• 5 MCM (wet year), 1.5-2.5 MCM dry year. • %nMAR = 37.7
	Period of inundation	• July to December, with water entering the system from April (standing water present for between six and eight months of the annual cycle). • Floods: >60% of natural floods for July, August and September
	Depth	• Wet season maximum 1.5 m AMSL (1.0 m above lowest point of pan). This depth to be achieved during July to August. • Wet season minimum. 0.8 m AMSL (provisional). • Dry season maximum. 0.55 m AMSL (0.15 m above lowest point of pan during 1st week of December).
	Downward seepage losses	• Negligible (estimated <0.001 m/d)
	Evaporation loss	• 1.2- 1.6 m/a
	Contribution from groundwater	• Undetermined
	Frequency for meeting requirement	• 2/3 years (provisional)
Water quality	• RQOs cannot be set for water quality with the current level of data available.	
Vegetation	• Genetically distinct vegetation assemblages are known to occur but RQOs cannot be set for vegetation with the current level of data available.	
Fish	• *Galaxias zebratus* and *Sandelia capensis* should be present. There are insufficient data to set numerical RQOs.	
Birds	• The Wadrif Wetland system is considered more important for birds than Verlorenvlei, in particular for the Southern Africa Pan-Coastal migrants	
General conditions	• There should be no expansion of agriculture or other landuses in to remaining intact wetland areas.	

Table 15: Water level and inundation RQOs for the Wadrift wetland upstream of the Wadrift Pan (estuary) (Category ≥C) (DWA, 2013)

ECOLOGICAL COMPONENT	RQOs	
Hydrology and Hydrodynamics	• Flows shall be sufficient to maintain the Wadrif wetlands and saltpan (estuary) in an ecological condition that is equal to C Category	
	Volume requirement	• 5 MCM (wet year) • %nMAR = 14.8 • Surface component will be met by EFR. However, a significant proportion of the EFR will be required from groundwater. • Volume of the groundwater component has crucial and important implications for the Wadrif Pan. • Floods: >60% of natural floods for July, August and September
	Period of inundation	• Perennial wetness to surface. Standing pools of water within the stands of palmiet
	Depth	• Not relevant. Wetland is essentially on a descending bend in the river, and should evidence groundwater discharge.
	Downward seepage losses	• Moderate to high
	Groundwater discharge	• High, quantity undetermined
	Evaporation loss	• Exacerbated by evapotranspiration
	Contribution from groundwater	• Significant
	Frequency for meeting requirement	• Annually
Water quality	• RQOs cannot be set for water quality with the current level of data available.	
Vegetation	• Wetlands should remain intact and the extent of invasion by woody alien plants should not increase.	
	• Wetland extent	• No expansion of agriculture or other landuses into the remaining intact wetland areas
	• Woody alien vegetation extent	• No further expansion of woody alien vegetation in to wetland areas
	• Wetland condition	• No change in WET-Health scores
Fish	• *Galaxias zebratus* and *Sandelia capensis* should be present. There are insufficient data to set numerical RQOs.	
Birds	• The abundance and diversity of birds in the wetland shall be equal to or greater than those measured prior to 2010. •	
	• Retain representative presence of rare or threatened species (e.g. Lesser Flamingo)	• Waders or terns are absent from theestuary for five consecutive counts

ECOLOGICAL COMPONENT	RQOs	
	• Retain representative species richness in particular of Southern Africa Pan-Coastal migrants	
	•	•
General conditions	•	

Note: Integration of the Reserves for the Wadrif Pan (estuary), the Wadrif Wetland and the lower Langvlei (Wadrif) River indicate that, even if the river Reserve is met (1.957 MCM per annum), surface flows will not support the requirements for the pan (5 MCM per annum; Table 26.7). Accordingly, while the C Category Reserve for the river will go some way to offsetting the present level of devastation in the river and pan but it will not maintain a C category in the pan (DWA, 2013)

APPENDIX 3: RECOMMENDED PERFORMANCE MONITORING PLAN

Table 16: Recommended Performance Monitoring Plan for the management of Wadrift River estuary

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
1. ESTUARINE HEALTH AND FUNCTION				
1.1 Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning	• Recommended reserve(s) signed off and implemented • Abstraction and discharge points identified and monitored, and continuous monitoring flow gauging probe installed • Water resource utilisation plan developed • Natural mouth dynamics monitored • MMP and MaintMP developed, approved and implemented • State of the estuary monitored • Prioritised RDM monitoring activities undertaken • Ecological health improved from E to D category	• Once a year	NWA, CARA	DWS, DEFF, BOfCMA, RMA, Cederberg LM, CapeNature
1.2 Ensure estuary requirements are integrated into catchment processes to ensure healthy water quality	• EMP included into catchment management strategy • Critical catchment and other maps updated • Effective catchment management • Good catchment water quality preserved • Mapping updated	• Once a year	NWA, NWA, MSA, CARA, NEM:BA, NEM; PAA	DWS, BOfCMA DALRRD, Cederberg LM, CapeNature
1.3 Minimise pollution by addressing activities that lead to poor water quality	• Water quality (WQ) monitoring programme implemented • Control of all polluting discharges/activities • Environmental best practice irt agriculture is implemented and enforced • Legal camping grounds investigated, and waste collected	• Quarterly for WQ monitoring programme • Twice a year	NWA, CARA	DEFF, Cederberg LM, CapeNature

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
1.4 Restore connectivity within the system	• Priority areas identified and rehabilitated and signage installed • Methods to restore connectivity identified • Estuarine habitat and functionality restored • Signage installed	• Once a year	NEMA, NWA, ICMA, WC TIA	RMA, DWS, DEFF, DoT, WC DPW
1.5 Ensure sustainable resource use through an effective level of compliance management	• Status of fish and bait stocks determined • Level of extractive use established • Carrying capacity established and enforced • Signage installed, and compliance management undertaken	• Twice a year	ICMA, MLRA	DEFF, CapeNature, GCBC
2. BIODIVERSITY CONSERVATION				
2.1 Ensure the conservation of representative estuarine habitats and indigenous species	• Spatial zonation plan implemented and enforced • Special management area (or other relevant conservation status) investigated and implemented • Ecological monitoring programme developed for birds and fish, particularly bird disturbance and species of concern Custodianship on adjacent properties • Appropriate regulations and bylaws are gazetted and enforced to protect fauna and flora • Reduced habitat degradation and inappropriate behaviour/activities • Ecological monitoring programme developed for birds and fish, particularly bird disturbance and species of concern	• Once a year	ICMA, NEMA, MLRA, LUPA, NWA, MLRA NEM:BA	CapeNature, RMA, DEFF, Cederberg LM, GCBC
3. LAND USE AND INFRASTRUCTURE DEVELOPMENT PLANNING				
3.1 Ensure appropriate and sustainable land use and coastal development in and around the Wadrift estuary, considering ecosystem services	• CML and its associated development controls implemented • EMP included in IDP and SDF and EFZ and no-go areas incorporated to all relevant government department documents • Bylaws developed and gazetted	• Annually	ICMA, LUPA	Cederberg LM, West Coast DM, DEA&DP and applicable authorities

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
	• EFZ incorporated in relevant government documents • EAF used as a source of I&APs			
4. INSTITUTIONAL AND MANAGEMENT STRUCTURES				
4.1 Ensure effective co-ordination of estuarine management responsibilities	• EMP adopted and incorporated into Cederberg LM SDF • Regional Estuarine management function established in DEA&DP • Needs analysis and skills training etc. undertaken • Good communication and working relationship established with implementing agencies • Regional EAF supported and meets on quarterly basis • Stakeholder database maintained, and missing stakeholders invited • RMA present on critical forums • Annual reporting undertaken by RMA • 5-year review of EMP undertaken	• Quarterly	ICMA, MSA, NEMA, LUPA, NWA	RMA, Cederberg LM, West Coast DM, applicable authorities
4.2 Define co-operative governance arrangements	• Active collaboration of various institutions, private and civil stakeholders • EAF to monitor performance of RMA • Individual agencies knowledgeable and with capacity and resources to carry out mandated actions • Budget allocations to be confirmed	• Annually	MSA, NWA, ICMA, NEMA, WC BRA, CARA	All applicable authorities
5. EDUCATION AND AWARENESS				
5.1 Promote high levels of public awareness and appreciation of the value of estuaries	• Education & awareness programme developed and implemented • Educational and informative material indicating zonation and allowable activities (including signage, posters, and pamphlets) sourced	• Every 3 years	ICMA	RMA, GCBC, CapeNature Cederberg LM, West Coast DM

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
6. DISASTER RISK MANAGEMENT				
6.1 Disaster prevention, preparedness and mitigation	• All developments and activities are legally compliant • Vulnerable areas rehabilitated • Key infrastructure defended • Pollution/spill contingency plan(s) developed and approved	• Annually	DMA, NEMA	RMA, WC DoT&PW, WC Dept of Local Gov: Disaster Management, Cederberg LM

APPENDIX 4: PROJECT PLAN TEMPLATE

ACTION	Describe the action to be undertaken
COMPLETION DATE	Provide date of expected completion
PERFORMANCE INDICATOR	
Requirements stipulated in policy and legislation	
Available methods, protocols and best practice-guides	
Spatial zonation consideration (e.g. limits/targets)	
Detailed work plan	Task 1: Task 2: Task 3: Task 4:
Scheduling	
Milestone/interim performance indicator	
Responsibilities for different tasks	E.g. Identify specific departments, personnel and/or service providers responsible for execution of this action
Monitoring and reporting plan	E.g. • Define data and information to measure in order to monitor performance indicator/s • Specify frequency at which data/information should be collected/monitored • Where and when to report on progress
Human resource plan	
Financial resource plan	

TASK	TIME (months)								
	1	2	3	4	5	6	7	8	9
1									
2									
3									
4									

MILESTONE	INTERIM PERFORMANCE INDICATOR	DUE DATE
1		
2		
3		

HUMAN RESOURCE	WEEKS PER TASK			
	1	2	4	4
Staff member 1				
Staff Member 2				
Service provider				

TASK	COST (ZAR)
1	
2	
3	
4	
TOTAL	

Source: DEA (2015)