



# **Seekoei Estuary Management Plan**

## **March 2018**

Prepared for



**Prof Tris H Wooldridge  
Prof Janine B Adams  
Dr Denise M Schael  
Dr Taryn Riddin**

**Institute for Coastal and Marine Research  
Nelson Mandela University  
PO Box 77000  
Summerstrand  
Port Elizabeth  
6031**

**Tel: +27 (0)41 504 2852  
Fax: +27 (0) 41 583 2317  
Email: tris.wooldridge@mandela.ac.za**

**<http://cmr.mandela.ac.za/Consulting/Seekoei-Estuary-Project>**

## Executive Summary

The Seekoei Estuary is a small Temporarily Open/Closed Estuary (TOCE) on the south-east coast of South Africa and together with its environs, has suffered a long history of man-induced changes. The natural structure and function of the estuary is severely compromised and the estuary is now largely dysfunctional.

Major pressures (summarized from the Situation Assessment Report) that currently affect the estuary are:

- Since 2006 freshwater supply to the estuary has reduced further. Freshwater abstraction levels are now estimated to be equal to, or even exceed the average annual runoff. Although some baseflow intermittently reaches the estuary, it is mostly the medium to larger floods that will temporarily restore some functioning of the estuary.
- The Present Ecological State (PES) has likely slipped below a score of 50, relegating the Seekoei Estuary to a Category E system. The estuary is therefore seriously modified and one of the most degraded estuaries in South Africa.
- Because of the severe reduction in baseflow, hypersaline conditions develop more frequently that at times, become lethal to the biota. Salinity levels above ca 50 become lethal to most species, although breeding will cease at lower levels for some.
- Because of freshwater reduction, the frequency and duration of mouth opening to the sea has decreased. Reduced connectivity with the sea leads to local extinctions if these species require a marine phase of development during their respective life cycles. The mudprawn *Upogebia africana* for example, no longer occurs in the estuary.
- In a similar way, if the estuary remains disconnected from the sea for extended periods, migration of species back to freshwater habitats discontinues and these species become locally extinct – some freshwater crabs are examples.
- Estuaries are obligatory nursery areas for numerous species of fish, including many of those important to recreational anglers. Temporal changes in mouth breaching and duration can potentially reduce the importance of the estuary as a nursery for juvenile fish. If the estuary remains closed during summer (October to April), the estuary is unavailable as a nursery area.
- Salinity patterns in the Seekoei estuary have also changed because of a reduction in freshwater supply. Plants and animals distribute themselves according to salinity preferences (freshwater to seawater). Reduced freshwater inflow compromises these gradients and some species disappear from the estuary.
- If the mouth of the estuary remains closed for extended periods, germination of salt marsh seeds is compromised.
- Freshwater wetlands in Paradise Beach have lost connectivity with the estuary due to poor road design and causeway construction. In one instance at least, a barrier wall was built across the wetland and must therefore be considered as an 'illegal dam'. The natural ephemeral nature of the wetland has therefore been altered artificially.
- The presence of the causeway has reduced connectivity between north and south parts of the estuary water body, negatively impacting mixing processes, tidal ebb and flow, salinity distribution and sedimentary processes. Evidence suggests that fine sediments (e.g. clay) become trapped behind the causeway and compact. These compacted sediments therefore

require floods of a greater magnitude to remove them, the potential scouring benefit of these floods further offset by the barrier-effect of the causeway.

- Although the causeway is a major issue impacting the ecological functioning of the estuary, the causeway provides significant benefits from an economic and social perspective for the community.
- Zonation of the Seekoei Estuary to manage various activities is of limited concern. The system is shallow and boating is only possible with small craft (e.g. dingy or canoe). Activities such as shore-line fishing, wind surfing and bird-watching, generally utilize different areas of the estuary.

The vision for the Seekoei Estuary is as follows:

*Restore the ecological health of the Seekoei Estuary, thereby enhancing social and economic benefits for residents and visitors to the area. Resources must be used responsibly and users of the estuary acknowledge that they are custodians of and are accountable for the estuary and, through the development of partnerships and integrated management of the estuary, ensure its sustainability.*

The following broad objectives have been identified. These objectives describe specific outcomes that aim to achieve the vision for the Seekoei Estuary:

- To facilitate equitable safe access to Paradise Beach with a disaster management plan and early warning detection system of potential threats.
- Ensure that the alternate route from Paradise Beach to Humansdorp/Jeffrey's Bay is upgraded and safe to drive under all conditions. The possibility of an additional route connecting Aston Bay with other centers should be explored.
- Implementation of an estuary management plan and a mouth management plan (a mouth maintenance plan is linked to the Mouth management plan).
- To ensure adequate freshwater inflow to the estuary to maintain open mouth conditions and a healthy, functional ecosystem.
- To promote custodianship of the Seekoei River Estuary through awareness, education and the integrated management of the estuary by the formation of partnerships between the public, surrounding industry and all spheres of government.
- To implement effective management of the estuary to ensure that future generations appreciate the estuary as an asset and to utilize and enjoy the estuary.
- To promote the Seekoei Estuary as a tourism and recreation asset.

To achieve the objectives identified for the Seekoei Estuary, the following management procedures are advocated:

**Management Priority 1:** Implement a mouth and maintenance management plan (see separate Mouth Management Plan document)

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
1.1 Implement Estuary Mouth and Maintenance Management Plan.	NEMA: Integrated Coastal Management Act.	Kouga Municipality.	Ensure safe crossing of the causeway (pedestrians and vehicles). Maintain salinity levels below lethal levels for the estuarine biota.	H

**Management Priority 2:** Upgrade the existing loop road between Paradise Beach and the Jeffrey's Bay-Humansdorp link road to a tarred surface.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
2.1 Upgrade the existing loop road to a tarred surface.		Provincial Road Works.	Safe passageway for vehicles under all weather conditions.	H

**Management Priority 3:** Provide a new and alternative route for residents in Aston Bay and environs should the causeway across the Seekoei be flood-damaged or removed at some time in the future. The present and direct route to Jeffreys Bay may on occasions also become temporarily impassable.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
3.1 Construct a new road from Aston Bay and connecting with the loop road from Paradise Beach to Humansdorp-Jeffreys Bay road.		Provincial Road Works/Kouga Municipality.	Safe passageway for vehicles and residents should the causeway and existing Aston Bay-Jeffreys Bay road become indefinitely closed to traffic.	H

**Management Priority 4:** Provide reasonable and safe public access between Paradise Beach and Aston Bay when using the causeway.

<b>ACTION</b>	<b>RELEVANT LEGISLATION</b>	<b>RESPONSIBLE AUTHORITIES</b>	<b>PERFORMANCE INDICATOR</b>	<b>PRIORITY ALLOCATED (H/M/L)</b>
4.1 Maintain and upgrade the road (if necessary) across the causeway.		Kouga Municipality.	Safe passageway for pedestrians and vehicles.	H
4.2 Install splash reflectors on either side of the causeway to reduce the incidence of splash overwash on the tarred surface.		Kouga Municipality.	Reduce splash across the road under conditions of high water levels and wind.	

**Management Priority 5:** Remove (or partly remove) the existing carpark and building (former swimming pool area) on the eastern side of the current mouth when the estuary is open.

<b>ACTION</b>	<b>RELEVANT LEGISLATION</b>	<b>RESPONSIBLE AUTHORITIES</b>	<b>PERFORMANCE INDICATOR</b>	<b>PRIORITY ALLOCATED (H/M/L)</b>
5.1 Remove or partly remove carpark and building (former swimming pool complex).	NEMA: Integrated Coastal Management Act.	Kouga Municipality.	Enable mouth channel to migrate eastwards to its former position across the sill under natural conditions.	H

**Management Priority 6:** Possible removal of the causeway to be considered after 2023.

<b>ACTION</b>	<b>RELEVANT LEGISLATION</b>	<b>RESPONSIBLE AUTHORITIES</b>	<b>PERFORMANCE INDICATOR</b>	<b>PRIORITY ALLOCATED (H/M/L)</b>
6.1 Possible removal of the causeway.	NEMA: Integrated Coastal Management Act.	Kouga Municipality.	Final removal of the causeway must only be considered after 2023, and if Management Priorities 1-4 are implemented.	H

**Management Priority 7:** Establish an Estuary and Wetland Management Committee for the Seekoei Estuary and wetlands.

<b>ACTION</b>	<b>RELEVANT LEGISLATION</b>	<b>RESPONSIBLE AUTHORITIES</b>	<b>PERFORMANCE INDICATOR</b>	<b>PRIORITY ALLOCATED (H/M/L)</b>
7.1 Establish an Estuary and Wetland Management Committee.	NEMA: Integrated Coastal Management Act.	Kouga Municipality/DEDEAT.	Advise Kouga Municipality on the Health status of the Estuary and wetlands. Advise on appropriate action when necessary.	H

**Management Priority 8:** Restore best attainable level of ecological functioning to improve the health of the Seekoei Estuary.

<b>ACTION</b>	<b>RELEVANT LEGISLATION</b>	<b>RESPONSIBLE AUTHORITIES</b>	<b>PERFORMANCE INDICATOR</b>	<b>PRIORITY ALLOCATED (H/M/L)</b>
8.1 Review legality and capacity of existing dams in the Seekoei Catchment.	NEMA: Integrated Coastal Management Act.	DWS.	Restore some baseflow to the estuary.	H
8.2 If required, implement legal procedures to ensure that landowners in the catchment adhere to water abstraction agreements.		DWS.	As above.	
8.3 Review and improve the confidence level of the ecological reserve study done in 2006.	NEMA: Integrated Coastal Management Act.	DWS.	Provide more accurate information on the estuary freshwater requirements.	
8.4 Improve freshwater baseflows to the Seekoei estuary through "Compulsory licensing" of activities.	NEMA: Integrated Coastal Management Act.	DWS.	Improve the ecological health of the estuary.	
8.5 Initiate research programmes to identify and map the extent of alien species distribution in the wetlands and estuary catchment.	NEMA: Integrated Coastal Management Act.	DWS.	First step in Improving the freshwater availability for the estuary.	
8.6 Develop an alien species eradication programme, guided by the results from 8.5 above.		DWS.	Increase the freshwater supply to improve the health of aquatic systems.	

**Management Priority 9:** Conserve and protect the remaining estuarine habitat within the Estuarine Functional Zone (EFZ).

<b>ACTION</b>	<b>RELEVANT LEGISLATION</b>	<b>RESPONSIBLE AUTHORITIES</b>	<b>PERFORMANCE INDICATOR</b>	<b>PRIORITY ALLOCATED (H/M/L)</b>
9.1 Conserve and protect remaining estuarine habitat within the EFZ.	NEMA: Integrated Coastal Management Act.	DEDEAT/Kouga Municipality.	Improve the health and sustainability of the aquatic ecosystems.	H
9.2 Develop a Conservation Plan for the Paradise Beach Wetlands.	NEMA: Integrated Coastal Management Act.	DEDEAT/Kouga Municipality.	Improve the health and sustainability of the aquatic ecosystems.	
9.3 Research and restore the connectivity of wetlands in the estuary functional zone with the estuary.	NEMA: Integrated Coastal Management Act.	DEDEAT/Kouga Municipality.	Restore connectivity and functioning of the aquatic water bodies.	

**Management Priority 10:** Develop monitoring programmes and encourage research on the Seekoei Estuary and wetlands.

<b>ACTION</b>	<b>RELEVANT LEGISLATION</b>	<b>RESPONSIBLE AUTHORITIES</b>	<b>PERFORMANCE INDICATOR</b>	<b>PRIORITY ALLOCATED (H/M/L)</b>
10.1 Develop monitoring programmes and encourage research programmes.	NEMA: Integrated Coastal Management Act.	DEDEAT/Kouga Municipality.	Improve decision-making on actions required to improve the health of the estuary and wetlands.	H



**Management Priority 11:** Promote local economic development through eco-tourism and recreation activities.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
<p>11.1 Promote local economic development and job creation.</p> <p>11.2 Promote the bird sanctuary as an attractive habitat for water birds particularly.</p> <p>11.3 Train local guides to lecture on the functioning of aquatic systems (e.g. the estuary, wetlands and their catchments). Included is the training of guides on bird identification and leading birding tours.</p>		<p>Kouga Municipality.</p> <p>DEDEAT.</p> <p>DEDEAT/Kouga Municipality.</p>	<p>Improve well-being of residents.</p> <p>Promote local economic development</p> <p>Create job opportunities</p>	<p>H</p>

**Management Priority 12:** Promote education and awareness of the Seekoei Estuary and wetlands.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
<p>12.1 Promote education and awareness of the Seekoei Estuary and wetlands.</p>		<p>Kouga Municipality</p>	<p>Improved public interest and a sense of value through an understanding of natural ecosystems, their connectivity and how they function.</p> <p>Encourages school groups and tourists to the area.</p>	<p>H</p>

**Management Priority 13:** Develop partnerships between residents and municipal management authorities.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
13.1 Develop partnerships between residents and municipal management authorities for the integrated management of the estuary.		Kouga Municipality.	Improved public interest and a sense of value and custodianship to promote the sustainability of the estuary, wetlands and their catchments. The interest of the community will also contribute to the optimal functioning of the Estuary and Wetland Management Committee.	H

## Table of Contents

Executive Summary.....	2
Table of Contents.....	10
List of Figures .....	11
List of Tables .....	11
List of Abbreviations .....	12
Terminology .....	13
1 Introduction .....	14
1.1 Background .....	14
1.2 Purpose of Estuary Management Plan .....	16
2 Synopsis of Situation Assessment.....	16
2.1 Introduction .....	16
2.2 Overview of ecological function and state of the estuary.....	17
2.3 Ecosystem Goods, Services and Threats to Ecological Functioning.....	20
2.4 Opportunities and Constraints for consideration in the Estuary Management Plan .....	24
2.6 Recommendations to address major information gaps .....	25
3. Local Vision and Objectives .....	25
3.1 Vision.....	25
3.2 Strategic Objectives .....	25
4 Management objectives and associated activities .....	26
5 Proposed zonation of activities .....	34
6 Recommended management priorities.....	35
7 Integrated monitoring plans .....	41
8 Institutional capacity and arrangements.....	48
9 References .....	52
10 Appendices .....	53

## List of Figures

Figure 1	Map of the Seekoei Estuary showing the resort towns of Paradise Beach (south of the estuary) and Aston Bay on the northern side. The Seekoei tributary to the south and the Swart to the north flow in to the estuary basin. Also shown are the habitat types below + 5 m MSL around the estuary (outlined by the red line). The area below the +5 m MSL contour line is referred to as the Estuary Functional Zone (EFZ). Note the extensive area of wetland to the west of Aston Bay.....	15
Figure 2	Land use patterns around the Seekoei Estuary. Note the numerous water storage reservoirs / dams associated with the two tributaries.....	18
Figure 3	Map of the Seekoei Estuary showing boundaries and points of interest. ....	35

## List of Tables

Table 1	Estuarine Health Classes used to indicate the PES relationship between ecosystem condition and functionality of South Africa’s estuaries.....	19
Table 4	The nature and significance of identified threats to the ecosystem goods and services provided by the Seekoei Estuary.....	22
Table 16	Management Objective 12: Promote education programmes on the Seekoei Estuary and wetlands. ....	33
Table 17	Management Objective 13: Develop partnerships between residents and municipal management authorities for the integrated management of the Seekoei Estuary.....	34
Table 12	Recommended management priorities.....	35
Table 13	Resource monitoring .....	42

## List of Abbreviations

CWAC	Co-ordinated Water Bird Counts
DEA	Department of Environmental Affairs
DEA: O+C	Department of Environmental Affairs: Oceans and Coasts
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism
DWS	Department of Water and Sanitation
ICMA	Integrated Coastal Management Act (Act No. 24 of 2008)
MAR	Mean Annual Runoff from the catchment
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMP	National Estuary Management Protocol (2013)
NMU	Nelson Mandela University
PES	Present Ecological State
RDM	Resource Directed Measures
TOCE	Temporarily Open/Closed Estuary

## Terminology

**Berm** in this document refers to the sand strip that separates the Seekoei Estuary and the surfzone on the seaward side. The berm is dynamic, increasing or decreasing in height relative to Mean Sea Level according to the interactive influence of dominant driving forces.

**Biota** refers to living organisms, plant and animal.

**CWAC counts** - Coordinated Water Bird Counts done at least twice a year (winter and summer) by local volunteers on identified wetlands. Programme initiated by the Animal Demography Unit (ADU) at the University of Cape Town.

**Ecological Reserve** refers to the quality, quantity and timing of freshwater inflows reserved to support ecosystem function.

**Estuarine classification** is the determination of an ecological class by taking ecological, social and economic factors into account, in a transparent, participatory process.

**Estuarine classification system** of Whitfield (1992) separates estuaries into permanently open estuaries, temporarily open/closed estuaries, estuarine lake systems, estuarine bays and river mouths.

**Estuarine Functional Zone (EFZ)** correlates with the 5 m topographical contour as delineated in the National Biodiversity Assessment: Estuary Technical Report (2012). This includes any open water areas, estuarine habitat (sand and mudflats, rock and plant communities) and floodplain areas.

**Estuarine ecosystem goods and services** are defined as the benefits that result from the ecological functioning of a healthy estuarine ecosystem. The ecosystem services that are provided are directly linked to the ecosystem goods.

**EFZ** – Estuary Functional Zone refers to the zone below the 5 m contour line.

**EMP** – Estuary Management Plan.

**Hypersalinity** occurs when the salt content of the water exceeds 35 parts per thousand. If salinity exceeds 50 - 55, the medium becomes lethal to the biota and mass mortality occurs. For many species, breeding will cease at lower levels.

**Present Ecological State** is a measure of the present quality (water quantity, water quality, habitat and biota) of the resource – assessed in terms of the degree of similarity to the reference condition.

**Productivity** the rate of biomass generation by living organisms.

**Reference condition** refers to the natural, unimpacted characteristics of a water resource, and represents a stable baseline.

**River baseflow** refers to the volume of freshwater flowing in to an estuary under normal conditions, i.e. floods excluded.

**TOCE** – Temporarily Open or Closed Estuary; connection with the sea is intermittent.

# 1 Introduction

## 1.1 Background

Estuaries represent the meeting place of rivers and the sea; salinity along the length of an estuary therefore ranges from freshwater at the river end (salt content of the water is near-zero), to full seawater at the other (salt content is around 35). Because of the ever-changing salinity, estuaries support a unique assemblage of plants and animals able to tolerate salinity fluctuations; species richness is relatively low, but abundance of individual species is high. Productivity (the rate of biomass generation by living organisms) is naturally high and estuaries are ranked among the most productive systems on the planet. Estuaries provide numerous goods and ecosystem services including the seasonal utilization of the estuary as a nursery for juvenile fish. However, anthropogenic activities in the catchment of estuaries can impact negatively on their health and functioning. Estuary management plans thus ensure that a balance is maintained between providing for human needs and the maintenance of natural estuarine functions.

The small Seekoei Estuary, a Temporarily Open-Closed Estuary (TOCE) is located between the resort towns of Aston Bay and Paradise Beach in the Eastern Cape. These two townships fall under the Kouga Municipality (one of seven in the Sarah Baartman District). Two tributaries (the Swart and the Seekoei) discharge into the Seekoei Estuary about 1.3 km from the beach (Figure 1). The two rivers originate northwest of the town of Humansdorp and are each approximately 35 km in length. At its widest point, the estuary is 580 m wide, with a variable depth profile. Tidal reach extended 4.2 km upstream and the original tidal prism was  $0.82 \times 10^6$  cubic metres of water per cycle (Esterhuysen 1982). The total area of the Seekoei Estuary is 276 ha (Refer to Table 9). The landscape between the estuary and Humansdorp is largely transformed, with extensive farming activity undertaken.

The need for Estuary Management Plans (EMPs) in South Africa is addressed in the Integrated Coastal Management Act (Act 24 of 2008; ICMA). Historically, estuaries and the management thereof have not been adequately addressed by marine, freshwater and biodiversity conservation legislation. However, the ICMA recognises the importance of estuaries and their management and outlines a National Estuarine Management Protocol (NEMP) to support this. The protocol identifies the minimum requirements for the development of EMPs, and delegates responsibility to relevant authorities and agencies to align and coordinate estuaries management at a local level.

The NEMP identifies three phases in the development of an Estuary Management Plan:

1. **Scoping phase**, which includes initial stakeholder engagement and the development of the Situation Assessment report

2. **Objectives setting phase** where:













- Vision and objectives for estuary management are identified.
- Geographical boundaries of the estuary are delineated and graphically represented.
- Spatial zonation of activities is determined.
- Management objectives and activities are described.
- An integrated monitoring plan is developed, and
- Institutional capacity and arrangements are discussed.

3. **Implementation phase**, which is based on:

- The development of an implementation strategy and project plans.
- Continuous monitoring and performance evaluation, based on performance indicators, and
- Review of the EMP every five years.



### Legend

 Beach	 Rocks	 Dune vegetation
 Sand and mudbanks	 Development	 Reeds and sedges
 Submerged macrophytes	 Floodplain	 Supratidal salt marsh
 Wetlands	 Phragmites	
 Water	 Terrestrial vegetation	

0 0.375 0.75 1.5 Kilometers




**Figure 1** Map of the Seekoei Estuary showing the resort towns of Paradise Beach (south of the estuary) and Aston Bay on the northern side. The Seekoei tributary to the south and the Swart to the north flow in to the estuary basin. Also shown are the habitat types below + 5 m MSL around the estuary (outlined by the red line). The area below the +5 m MSL contour line is referred to as the Estuary Functional Zone (EFZ). Note the extensive area of wetland to the west of Aston Bay.



### 1.2 Purpose of Estuary Management Plan

The Estuarine Management Plan (EMP) has been developed in two phases: 1.) Situation Assessment Phase; and 2.) Estuarine Management Plan and Implementation Plan. The EMP has been developed through a public consultative process, which included two major workshops and direct engagement with key stakeholders who requested additional engagement with the team.

The Situation Assessment report provided the baseline assessment to inform the EMP and aided in the development of the local vision for the Seekoei Estuary and the identification of management objectives and priorities, and should be read in conjunction with this EMP.

The purpose of this EMP for the Seekoei Estuary is to:

- Provide a summary of the Situation Assessment.
- Define and delineate the geographical boundaries of the Seekoei Estuary.
- Highlight the local vision and objectives of the management of the Seekoei Estuary.
- Identify management objectives pertaining to the Seekoei Estuary.
- Delineate and map proposed zones to which specific activities should be allocated.
- Provide recommended management priorities, and
- Develop an integrated monitoring plan for the implementation of the EMP.

## 2 Synopsis of Situation Assessment

This chapter provides a synopsis of the detailed Situation Assessment report that was developed for the Seekoei Estuary. The detailed Situation Assessment Report is available from <http://cmr.mandela.ac.za/Consulting/Seekoei-Estuary-Project>.

### 2.1 Introduction

Temporarily open/closed estuaries (TOCE's) such as the Seekoei constitute more than 72% of our estuarine types in South Africa (Whitfield 1992, Perissinotto *et al.* 2010). The physico-chemical attributes of these estuaries are recognizably very different when compared to the other four broad estuarine types, supporting their own unique floral and faunal assemblages. Changes in biotic structures and ecological functioning between individual TOCEs also exist, linked to physico-chemical conditions at any time.

Anthropogenic impacts change the physico-chemical environment and concomitantly biotic response. Historically, effective management of our estuaries were not adequately addressed by marine, freshwater and biodiversity conservation legislation. This led to The Integrated Coastal Management Act (Act 24 of 2008, ICMA) which recognized the importance of estuaries together with their effective management. Estuary Management Plans (EMPs) for all South African estuaries became mandatory in terms of the Act and this Act outlines a National Estuarine Management Protocol (NEMP) to support this.

The Seekoei Estuary is located between the resort townships of Aston Bay on the eastern side and Paradise Beach on its western side (Figure 2). These two townships fall under the Kouga municipality (one of seven in the Sarah Baartman District) which has approximately 113 000 residents in the

municipal area (Kouga Integrated Development Plan 2017 – 2022, (Kouga Municipality 2017). Kouga is the second smallest region in district, covering only 4.1% of the land area. Despite its relative small size, it is the most populous region representing approximately 24% of the total population in the district.

### 2.2 Overview of ecological function and state of the estuary

The geographical boundaries (see Figure 1) are defined as follows (Gauss Projection, Clarke 1880 Spheroid):

Downstream boundary: The estuary mouth (34° 05' 10" S, 24° 54' 30" E)

Upstream boundary: Seekoei River (34° 05' 20" S, 24° 51' 50" E)

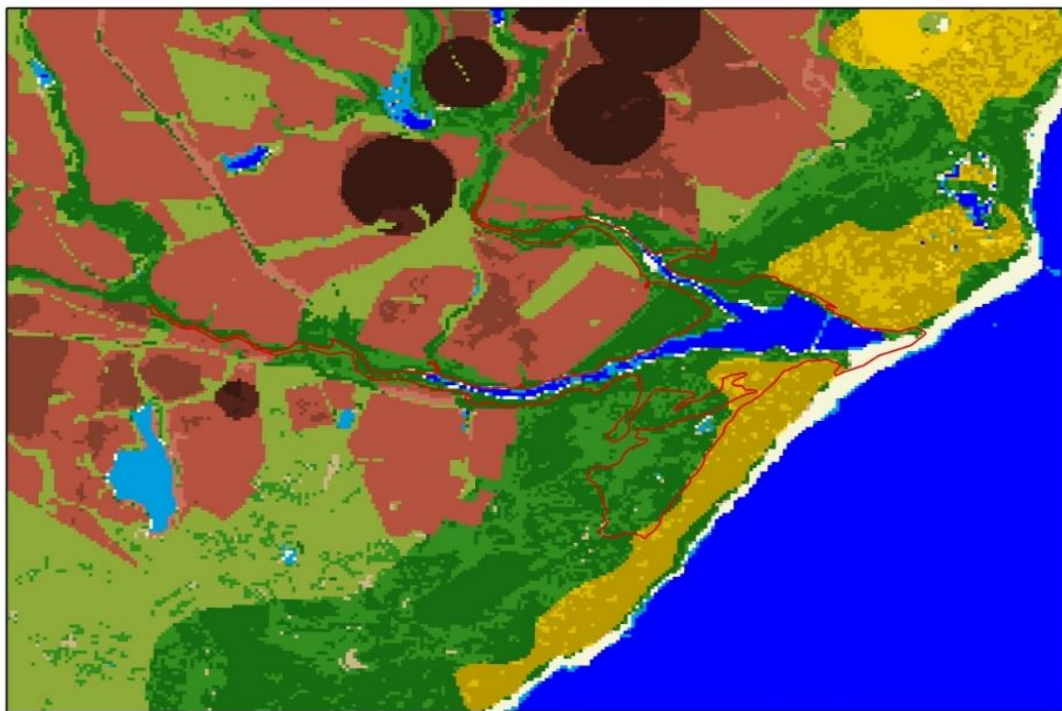
Swart River (34° 04' 35" S, 24° 52' 35" E)

Lateral boundaries: +5 m MSL contour along the banks.












The catchment of the Seekoei Estuary is strongly associated with intense agricultural activities. On the coast, the townships of Aston Bay and Paradise Beach flank the estuary. Figure 2 illustrates land patterns surrounding the estuary. The Seekoei Estuary and environs have a long history of man-induced changes, some of which have impacted the structure and functioning of the system in a severe way. Whitfield and Bruton (1989) and Reddering (1988a,b) described the Seekoei as a freshwater starved estuary. Along with dams (large and small, Figure 5 in the Situation Assessment Report) in the catchment, other forms of water abstraction include irrigation and non-irrigation uses. The natural runoff for the Seekoei was estimated at 20.27 Million m<sup>3</sup>/year which have been reduced by 44% to 11.36 Million m<sup>3</sup>/year in 2005 (DWS 2006b). Most of this significant flow reduction was in the baseflow component as there is no large dams in the catchment, manifesting as a zero or near zero inflow for months at a time to the estuary.

Based on DWS reporting and model estimates, approximately  $17.35 \times 10^6$  m<sup>3</sup> of water is abstracted/stored from the catchment from non-irrigation (0.8%), irrigation (57%) and current storage (42% dams). Given that the average annual runoff for the catchment equals to, or surpasses runoff at times, further demonstrating the impact of the lack of freshwater inflow on the estuary.

Invasive alien plants such as *Acacia mearnsii* (Black Wattle), *Acacia cyclops* (Rooikrans) or species of *Eucalyptus* among others use much more water than indigenous trees and plants. Water consumption by these invaders can lead to reduction in river flow, or even the drying up of springs and streams. In the case of the Seekoei Estuary, invasive plants (particularly the *Acacia* species) in the relatively small catchment will impact downstream waterflow in a meaningful way, further leading to negative impacts on the estuary.



**Legend**

 Water seasonal	 Cultivated comm fields (high)	 Bare none vegetated
 Water permanent	 Cultivated comm fields (med)	 Urban village (dense trees / bush)
 Thicket /Dense bush	 Cultivated comm fields (low)	 Urban village (open trees / bush)
 Woodlan/Open bush	 Cultivated comm pivots (high)	 Urban village (low veg / grass)
 Grassland	 Cultivated comm pivots (med)	 Urban village (bare)
 Shrubland fynbos	 Cultivated comm pivots (low)	



**Figure 2** Land use patterns around the Seekoei Estuary. Note the numerous water storage reservoirs / dams associated with the two tributaries.

**Climate change** impacts such as sea level rise are likely to pose various risks on coastal infrastructure in the +5 m MSL contour high risk zone. This contour line is currently proposed as an exclusion or “no-go” zone with regards to future development. The +10 m MSL contour line is recommended for future development lines.

**Assessment of the health condition of estuaries** is also referred to as the Present Ecological State (PES). Six “PES” classes are used to describe the condition of the estuaries. Physically estuaries are highly dynamic when compared to other aquatic ecosystems. Therefore, a shift from a dynamic to a more stable system is an indicator of severe degradation of an estuarine system. The six categories are described in the table below:

**Table 1 Estuarine Health Classes used to indicate the PES relationship between ecosystem condition and functionality of South Africa’s estuaries.**

Estuarine health class	Description	Ecological state	Functionality
<b>A</b>	Unmodified, natural.	Excellent	Retains Processes or Patterns
<b>B</b>	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions and processes are essentially unchanged.	Good	
<b>C</b>	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions and processes are still predominantly unchanged.	Fair	Loss of Process or Patterns
<b>D</b>	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions and processes have occurred.		
<b>E</b>	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions and processes are extensive.	Poor	Little/No Process or Patterns
<b>F</b>	Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions and processes have been destroyed and the changes are irreversible.		

The **Ecological Health state** for the Seekoei Estuary was determined in 2006 (DWA 2006). At the time the study was completed, the recommended ecological category suggested by the Directorate: Resource Directed Measures (RDM) for the Seekoei Estuary was a D. This category represents a largely modified system with a large loss of natural habitat, biota and basic ecosystem functions and processes have occurred (Refer to Situation Assessment report, Section 6.7).

It is important to note that although the Habitat Health of the systems equates to a D (50), the Biotic Health is in a Category E (35). It is therefore believed that the Seekoei Estuary is on a trajectory of change to a Present Ecological Status of a Category E. Management intervention is urgently required to prevent further degradation. A summary of the individual abiotic and biotic component categories in the Seekoei Estuary and the PES for each is summarised in the Table 2.

**Table 2 Summary of the abiotic and biotic scores for the Seekoei Estuary.**

Variable	Weight	Score	Weighted score
Hydrology	25	58	14
Hydrodynamics and mouth condition	25	40	10
Water quality	25	40	12
Physical habitat alteration	25	61	15
<b>Habitat health score</b>			<b>50</b>
Microalgae	20	35	7
Macrophytes	20	35	7
Invertebrates	20	30	6
Fish	20	35	7
Birds	20	40	8
<b>Biotic health score</b>			<b>35</b>
<b>Estuarine health score</b>			<b>42</b>

### 2.3 Ecosystem Goods, Services and Threats to Ecological Functioning

Both direct and indirect users rely on the goods and services provided by the Seekoei Estuary (Table 3). Direct users utilise resources for financial or recreational purposes that include: subsistence and recreational fishermen, bait collectors and boaters. Indirect users are defined as users that indirectly rely on resources the estuary provides. Examples of ways in which the Seekoei Estuary is indirectly utilised include the following: tourism, waste disposal and water purification.

With regards to **threats to ecological functioning** of the Seekoei Estuary, the National Biodiversity Assessment (2011) Estuary Technical Report identifies the major pressures that affect the ecological functioning of the Seekoei Estuary as change in water flow and the causeway. Habitat loss and fishing effort were considered contributing pressures to the estuary's ecological functioning. With regards to specific ecological goods and services provided by the Seekoei Estuary, a variety of factors threaten the sustainability of these ecological goods and services. The nature of the threats that impact the provision of these ecological goods and services are summarized in Table 4.

Table 3 Ecosystem goods and services provided by the Seekoei Estuary.

Clean air	Air quality improves, and greenhouse gas emissions are reduced through the photosynthetic processes associated with phytoplankton and vegetation along the banks of the Seekoei Estuary.
Improved water quality	The Seekoei Estuary contributes to the dilution and assimilation of waste that enters the estuary resulting from activities both within the Estuarine Functional Zone (EFZ) and the wider catchment area. Waste is diluted by the water column as well as through the influence of tidal pumping. Organic and inorganic wastes are also assimilated and accumulated in the sediment of the Seekoei Estuary.
Natural resources	Recreational fishing and bait collection is practiced in the Seekoei Estuary. However, due to its relative small size the estuary does not support large scale operations or commercial fishing.
Habitat	The Seekoei Estuary provides a nursery for fish and invertebrate species that utilize estuaries during part of their life cycle. Examples of the species that have been recorded in the Seekoei Estuary include: Southern mullet, <i>Liza richardsonii</i> , Spotted Grunter <i>Pomadasys commersonnii</i> , Cape Mooney, <i>Monodactylus falciformis</i> and the threatened White steenbras, <i>Lithognathus</i> .
Migration route	The Seekoei Estuary provides a migratory corridor between the sea and rivers for those organisms utilizing either freshwater habitats or the sea, sometimes on a temporary basis. An example is the freshwater mullet, <i>Myxus capensis</i> .
Recreation	Recreational activities on the estuary include boating, board-sailing and recreational angling, although these activities have probably become less popular in recent times due to reduced water depth and/or excessive macrophyte growth. However, birding remains popular, particularly with day-trippers.
Tourism	Paradise Beach and Aston Bay are popular holiday destinations and there are numerous accommodation facilities to support tourism. Both the estuary and pristine beaches are strong attractants to the area, including day-trippers.
Research opportunities	The Seekoei Estuary is one of numerous Temporarily Open/Closed Estuaries (TOCEs) along the south coast of the Eastern Cape Province and because of its proximity to regional Research Centres, represents an important opportunity for research programmes. The value of the estuary for research is strongly linked to the numerous freshwater wetland habitats adjacent to the estuary to the west.
Aesthetic/ Scenic value	The location of the estuary in a clean-air environment and minimal traffic congestion and noise provides a sought-after aesthetic experience for residents and visitors.

**Table 2 The nature and significance of identified threats to the ecosystem goods and services provided by the Seekoei Estuary.**

<p>Freshwater supply in terms of the general functioning of the estuary</p>	<p>Supply of freshwater from the catchment to the estuary is seriously compromised, with abstraction levels now estimated to be equal to, or exceeding the average annual runoff. Without an adequate supply of freshwater, the system is no longer a functional estuary. Although some baseflow will reach the estuary intermittently, it is mostly the medium to larger floods that will temporarily restore some functioning of the estuary. The lower photograph on the cover of this report reflects the situation of zero inflows to the estuary for much of 2017 and into 2018. This photograph was taken a few days after about 60 mm of rain fell over two-three days (17 Nov 2017).</p>
<p>Freshwater supply and estuarine salinity gradients</p>	<p>Plants and animals distribute themselves according to salinity preferences along salinity gradients in an estuary (freshwater to seawater). Reduced freshwater inflow compromises these gradients and some species disappear from the estuary.</p>
<p>Freshwater baseflow and its influence on state of the mouth</p>	<p>Because of freshwater abstraction, the frequency and duration of mouth opening to the sea is reduced. Salinity patterns in the estuary therefore change, often affecting components of the estuarine biota in a negative way.</p>
<p>Extended periods of inundation of marginal vegetation</p>	<p>If the mouth of the estuary remains closed for extended periods, germination of salt marsh seeds will be compromised due to flooding / inundation.</p>
<p>Freshwater supply and its importance to the bird sanctuary</p>	<p>Both abundance and species richness of water fowl will decline if salinity in the estuary persistently remains at relatively high levels.</p>
<p>Migration of biota between rivers and the sea.</p>	<p>If the estuary remains disconnected from the sea for extended periods, natural migration of numerous species through the estuary ceases. Recruitment patterns are disrupted and some species may become locally extinct from these rivers.</p>
<p>The estuary as a nursery</p>	<p>Estuaries are obligatory nursery areas for numerous species of fish, including many of those important to recreational anglers. Temporal changes in breaching events because of artificial breaching, reduced freshwater baseflows and loss of connectivity will reduce the importance of the estuary as a nursery for juvenile fish.</p>
<p>Ebb-tidal plumes in the nearshore</p>	<p>Ebb-tidal plumes provide migratory cues to young fish migrating to estuarine nursery areas or even for those species using the habitat temporarily.</p>

Reduced freshwater baseflow vs evaporation rate	If the evaporation rate exceeds baseflow per unit time, salinity in the estuary increases and the structure of the biotic community changes. Species richness also decreases.
Hypersalinity	Because freshwater baseflow to the estuary is significantly reduced, hypersaline conditions develop more frequently that at times, become lethal to the biota. Salinity levels above ca 50 become lethal to most species, although breeding will cease at lower levels for some.
Present Ecological State	Evidence suggests that since 2006, freshwater inflow to the estuary has been further reduced. The PES has likely slipped below a score of 50, relegating the Seekoei Estuary to a Category E system. The estuary is therefore seriously modified and one of the most degraded estuaries in South Africa. At the time of the 2006 study, it was estimated that approximately 56% of the MAR still reached the estuary (see Section 6.7 of the Situation Assessment Report).
The existing carpark and position of the mouth channel across the berm	The estuary mouth channel is now permanently forced to the south by the presence of the carpark. The natural east-west movement of this channel is now compromised over time, and tidal exchange patterns during low flow periods have changed.
Connectivity of the estuary with the nearshore	Historically, evidence suggests that the estuary remained open to the sea for extended periods. As freshwater baseflows decreased because of increasing abstraction, functioning of the estuary declined progressively. In addition, artificial breaching, obstruction of tidal flows and relocation of the mouth have all contributed to premature closure of the mouth. The value of goods and services therefore also declined.
Presence of the causeway	Connectivity between north and south parts of the estuary water body reduced, negatively impacting mixing processes, tidal ebb and flow, salinity distribution and sedimentary processes. Evidence suggests that fine sediments (e.g. clay) become trapped behind the causeway and compact. These compacted sediments therefore require floods of a greater magnitude to remove them, the potential scouring benefit of these floods further offset by the barrier-effect of the causeway.
Accumulation of pollutants	Because of intense farming activity in the catchment, organic and inorganic pollutants are likely to be flushed into the estuary after heavy rainfall.
Artificial breaching of the mouth	Breaching at a lower water level compared to natural will result in less efficient removal of accumulated sediment. Sediment removal increases exponentially with increasing current velocity. There is currently discussion on the correctness of the original survey data relative to MSL and associated with the causeway.



### 2.4 Opportunities and Constraints for consideration in the Estuary Management Plan

The **opportunities** for effective integrated management of the Seekoei Estuary were identified through the desktop assessment and site visits as well as through stakeholder engagement. Opportunities that were identified are listed below.

- Current conditions impacting the Seekoei Estuary in a negative way can be partly reversed, improving the Ecological Health of the system. This is in line with recommendations outlined in the Ecological Water Requirement Study. Because of the proclaimed Provincial Bird Sanctuary on the Seekoei, the status of the estuary should be improved to Level B (currently the estuary is classified as Level D). Level B probably represents the best attainable level under present circumstances.
- To restore the estuary as a functional system supporting a rich biotic community. This will attract visitors to the area and promote tourism and business opportunities for the local community.
- Further development of the tourism industry. Send local people on training courses to become bird guides. They could then earn an income from guiding birders visiting the area.
- Minimize potential threats of climate change through informed decision making around infra-structure development and management strategies.
- Establishment of a co-operative estuarine management forum including residents, municipal management, and other relevant authorities.

The **constraints** for the effective implementation of estuarine management objectives are listed below. Some of these became apparent during the Reserve Study undertaken by the Department Water Affairs Forestry (2006);

- Because of intermittent incidents of reduced or zero baseflows (zero baseflows may persist for months), salinity levels may rise to excessive levels (a salinity of 98 is on record) and no estuarine biota survives such levels. Such events may become more common in future.
- Over- and possible illegal abstraction of freshwater upstream.
- Alien vegetation increasing in extent in the catchment.
- Increased pollution from river runoff or agricultural return flow from farming activities in the catchment.
- Injury or loss of human life in the event of an accident on the causeway during inclement weather conditions and/or water levels overtopping the crossing.
- Freshwater and seawater flooding leading to erosion and removal of causeway.
- Socio-economic issues that lead to higher crime rate.

## **2.6 Recommendations to address major information gaps**

The major information gaps pertaining to the Situation Assessment Report include the following:

- A. Lack of freshwater inflow data and mouth management data specific to the Seekoei Estuary.
- B. Lack of water quality data specific to the Seekoei Estuary.
- C. There is a lack of biotic data specific to the Seekoei Estuary.
- D. Potential changes in the rate and volume of sand moving alongshore on the beach.
- E. Sedimentation in the estuary, regular bathymetric surveys needed.

Universities, and other relevant institutions must assist in providing relevant information where available. Information gaps should be prioritised in the Seekoei EMP as research opportunities.

## **3. Local Vision and Objectives**

### **3.1 Vision**

The vision for the Seekoei Estuary should reflect the desired state of the estuary and should provide the starting point for the identification of management objectives for the estuary. The vision for the Seekoei Estuary has been developed through stakeholder input and their expectations for the overall outcome of the effective management of the estuary. From the stakeholder input, the following vision for the Seekoei Estuary has been proposed:

#### ***Vision Statement***

*Restore the ecological health of the Seekoei Estuary, thereby enhancing social and economic benefits for residents and visitors to the area. Resources must be used responsibly and users of the estuary acknowledge that they are custodians of and are accountable for the estuary and, through the development of partnerships and integrated management of the estuary, ensure its sustainability.*

### **3.2 Strategic Objectives**

The following objectives have been identified that describe specific outcomes that aim to achieve the vision for the Seekoei Estuary:

- To facilitate equitable safe access to Paradise Beach with a disaster management plan and early warning detection system of potential threats. Implement a mouth management plan including a maintenance management plan.
- To ensure adequate freshwater inflow to the estuary to maintain open mouth conditions and a healthy, functional ecosystem.
- To implement effective management of the estuary to ensure that future generations appreciate the estuary as an asset and to utilize and enjoy the estuary.
- To promote the Seekoei Estuary as a tourism and recreation asset.

- To promote custodianship of the Seekoei Estuary through awareness, education and the integrated management of the estuary by the formation of partnerships between the public, surrounding industry and all spheres of government.
- Ensure that the alternate route from Paradise Beach to Humansdorp/Jeffrey's Bay is upgraded and safe to drive under all conditions. The possibility of an additional route connecting Aston Bay with other centres should be explored.

### 4 Management objectives and associated activities

The management objectives for the Seekoei Estuary have been developed from the opportunities and threats identified during the Situation Assessment as well as from the local vision and objectives for the estuary. These are:

1. Implement a mouth and maintenance management plan.
2. Upgrade the existing loop road between Paradise Beach and the Jeffrey's Bay-Humansdorp link road to a tarred surface.
3. Provide a new and alternative route for residents in Aston Bay and environs should the causeway across the Seekoei be flood-damaged or removed at some time in the future. The potential also exists that the current road from Aston Bay/Marina Martinique to Jeffrey's Bay may become impassable on occasions.
4. Provide reasonable and safe crossing between Paradise Beach and Aston Bay when using the causeway (vehicles and pedestrians).
5. Remove the carpark (or a major section) as well as the existing building on the eastern side of the current mouth area of the estuary.
6. Possible removal of the causeway to be considered after 2023.
7. Establish the Estuary and Wetland Management Committee for the Seekoei Estuary and wetlands.
8. Restore best attainable level of ecological functioning to improve the health of the Seekoei Estuary.
9. Conserve and protect the remaining estuarine habitat within the Estuarine Functional Zone.
10. Develop monitoring programmes and encourage research on the Seekoei Estuary and wetlands.
11. Promote local economic development through eco-tourism and recreation activities.
12. Promote education programmes on the Seekoei Estuary and wetlands.
13. Develop partnerships between residents and municipal management authorities for the integrated management of the Seekoei Estuary.

The management objectives have been assigned proposed activities and where applicable, a description of the ecological impact or socio-economic consequence, the responsible implementing agent, a cost estimate as well as the expected duration in which the action should be implemented have been provided (Tables 5 - 17).

## Management Objectives and Associated Activities

**Table 5 Management Objective 1: Implement a mouth and maintenance management plan (see separate Mouth Management Plan document).**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
8.1 Implement estuary mouth and maintenance management plan.	Implement estuary mouth and maintenance management plan to ensure safe passage across the causeway.	Kouga Municipality and DEDEAT.		Immediately (2018).

**Table 6 Management Objective 2: Upgrade the existing loop road between Paradise Beach and the Jeffrey's Bay-Humansdorp link road to a tarred surface.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
6.1 Upgrade the existing loop road to a tarred surface.	Provide a safe route for residents of Paradise Beach to access essential services when the causeway road is not open to traffic.	Provincial Government and Kouga Municipality.		2 yrs.

**Table 7 Management Objective 3: Provide a new and alternative route for residents in Aston Bay and environs should the causeway across the Seekoei be flood-damaged or removed at some time in the future. The present and direct route to Jeffreys Bay may on occasions also become temporarily impassable.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
7.1 Additional connecting road between Aston Bay environs and other centres.	The potential exists that Aston Bay and environs may become intermittently isolated in the future.	Kouga Municipality.		Up to end of 2023.

## Management Objectives and Associated Activities

**Table 8 Management Objective 4: Provide reasonable and safe public access between Paradise Beach and Aston Bay when using the causeway.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
5.1 Maintain and upgrade (if necessary) the road across the causeway.	Provide pedestrians and traffic safe movement across the causeway. Learners, Employees, essential and emergency services included.	Kouga Municipality.		Up to end of 2023.
5.2 Install splash reflectors on either side of the causeway	As above.	Kouga Municipality.		At least up to the end of 2023.

**Table 9 Management Objective 5: Remove (or partly remove) the existing carpark and buildings on the eastern side of existing mouth channel when the estuary is connected to the sea.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
9.1 Remove (or partly remove) existing carpark and fixed structures near the mouth.	Provide opportunity for the mouth channel to migrate to its former position across the sill. It may be possible to retain a section of the existing carpark to provide parking.	Kouga Municipality.		2 years.

**Table 10 Management Objective 6: Possible removal of the causeway to be considered after 2023.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
10.1 Possible removal of the causeway.	Ecologically and from a maintenance perspective, the causeway is highly problematic and should eventually be removed. From an economic and social perspective, the causeway is currently indispensable.	Kouga Municipality.		After 2023.

## Management Objectives and Associated Activities

	Alternate options must be explored. Removal of the causeway should only be considered after Management Objectives 1 to 4 are satisfactorily resolved.			
--	---	--	--	--

**Table 11 Management Objective 7: Establish an Estuary and Wetland Management Committee for the Seekoei Estuary and wetlands.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
11.1 Establish an Estuary and Wetland Management Committee.	Inform Municipal Manager on the health status of the estuary and wetlands and advise of any remedial action that should be taken.	DEDEAT, Kouga Municipality.		6 months.

**Table 12 Management Objective 8: Restore best attainable level of ecological functioning and improve the health of the Seekoei Estuary.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
12.1 Review legality and capacity of existing dams in the Seekoei catchment.	Provide a more accurate assessment of freshwater supply available for improved estuarine functioning.	DWS.		6 months.
12.2 If required, implement legal procedures to ensure that landowners in the catchment adhere to water abstraction agreements.	Improve freshwater supply to the Seekoei Estuary, particularly baseflows. Coupled to Objective 12.1 above.	DWS.		3 years.
12.3 Review and improve the	Using results from Management Objective 10	DEDEAT.		18 months.

## Management Objectives and Associated Activities

	confidence level of the ecological reserve study done in 2006.	(Table 14 below), generate more accurate estimates of freshwater inflows to the estuary – floods and baseflows.			
12.4	Improve freshwater baseflows to the Seekoei Estuary through “Compulsory licensing” of activities.	Institute “Compulsory licensing” of water usage in the catchment to ensure baseflows to the estuary. Restore best attainable level of Estuarine health as recommended in the Reserve Study.	DEDEAT, DWS.		2 years.
12.5	Initiate research programmes to identify and map the extent of alien species distribution in the wetlands and catchment.	Results will inform an alien species eradication programme and therefore contribute to the improved health of the aquatic system – wetlands, catchment and estuary.	DEDEAT, DWS, Kouga Municipality and Regional Research Institutes.		1 year.
12.6	Develop an alien species eradication programme, guided by the results from 12.5 above.	Improve the natural functioning of the aquatic system as a unit, including increased baseflow volumes from the catchment if invasive plant infestation is high.	As above.		2 years.

**Table 13 Management Objective 9: Conserve and protect the remaining estuarine habitat within the Estuarine Functional Zone (EFZ).**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
13.1 Conserve and protect remaining estuarine habitat within the EFZ.	Inform decision-makers on the health status of the estuary and wetlands and advise of any remedial action that should be taken.	DEDEAT, Kouga Municipality and Estuary and Wetland Management Committee.		6 months.
13.2 Develop a Conservation				1 year.

## Management Objectives and Associated Activities

<p>Plan for the Paradise Beach Wetlands.</p> <p>13.3 Research, and if necessary, restore the connectivity of wetlands in the estuary functional zone with the estuary.</p>	<p>Ensure Natural Functioning of the wetlands to maximize benefits of Goods and Services provided by the wetlands.</p> <p>Restore natural functioning of the wetlands (ephemeral), and through-flow to the estuary. Restored connectivity with the estuary will also provide localized habitat for biota that favour low salinity conditions at the confluence with the estuary.</p>	<p>DEDEAT, Kouga Municipality and Estuary and Wetland Management Committee.</p> <p>DEDEAT, Kouga Municipality and the Estuary and Wetland Management Committee.</p>		<p>1 year.</p>
--	--	---	--	----------------

**Table 14 Management Objective 10: Develop and implement monitoring programmes and encourage research on the Seekoei Estuary and wetlands.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
<p>14.1 Develop and implement monitoring programmes for the Seekoei Estuary and wetlands.</p>	<p>Provide specific information to the Estuary and Wetland Management Committee that will help guide decision-making (see detail in the Monitoring section and Mouth Management Plan).</p>	<p>DEDEAT, Kouga Municipality.</p>		<p>1 year.</p>
<p>14.2 Encourage research programmes, including an understanding of the rate of sedimentary processes in the estuary and along the beach. Included is the origin of sediment types</p>	<p>Provide specific information to the Estuary and Wetland Management Committee that will help guide decision-making (see detail in the Monitoring section and Mouth Management Plan). Linked also to Objective 12 below (Table 16).</p>	<p>DEDEAT, Kouga Municipality.</p>		<p>1 year.</p>



**Table 15 Management Objective 11: Promote local economic development through tourism and recreation activities.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
15.1 Promote local economic potential and tourism.	The local economy will benefit considerably, particularly when all Objectives noted above are realized.	Jeffrey's Bay Tourism, Kouga Municipality, DEDEAT and Estuary and Wetland Management Committee.		Ongoing.
15.2 Manage the bird sanctuary to encourage birds (particularly water birds) to the area.	Promotes the sustainability of the estuary and wetlands.	Jeffrey's Bay Tourism, Kouga Municipality, DEDEAT and Estuary and Wetland Management Committee.		Ongoing.
15.3 Train local guides to inform interest groups on aspects of aquatic and terrestrial ecosystems (includes guiding bird enthusiasts - linked to Objectives 12 and 13 below, Table 16 - 17).	Promotes awareness and provide job opportunities.	Jeffrey's Bay Tourism, Kouga Municipality, DEDEAT and Estuary and Wetland Management Committee.		Ongoing.

**Table 3 Management Objective 12: Promote education programmes on the Seekoei Estuary and wetlands.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
16.1 Promote education and awareness of the estuary and wetlands.	Promotes an understanding of natural ecosystems and how they function.	Jeffery's Bay Tourism, Kouga Municipality, DEDEAT.		Ongoing.
16.2 Construct two bird hides (following SANPARKS guidelines) on a freshwater wetland and on the estuary.	Promotes public interest and a sense of value through an understanding of natural ecosystems. Encourages school groups and tourists to the area. Location of these hides decoded after consultation with the St Francis Bird Club.	Jeffery's Bay Tourism, Kouga Municipality, DEDEAT.		Ongoing.
16.3 Design and construct informative displays of estuary, wetlands and their biota. Initiate educational workshops.	Promotes public interest and a sense of value through an understanding of natural ecosystems, their connectivity and how they function. Encourages school groups and tourists to the area.	Jeffery's Bay Tourism, Kouga Municipality, DEDEAT.		Ongoing.

**Table 4 Management Objective 13: Develop partnerships between residents and municipal management authorities for the integrated management of the Seekoei Estuary.**

PROPOSED ACTIVITY	ECOLOGICAL IMPACTS/SOCIOECONOMIC CONSEQUENCES	PROPOSED IMPLEMENTING AGENTS	ESTIMATED COST	EXPECTED DURATION
17.1 Develop partnerships between residents and municipal management authorities.	Development a sense of custodianship between interested parties and thereby contribute to the health and sustainability of the estuary, wetlands and their catchments. A sense of custodianship will also contribute to the optimal functioning of the Estuary and Wetland Management Committee.	Kouga Municipality.		Ongoing.

## 5 Proposed zonation of activities

The development of zonation plans, particularly within aquatic environments, is becoming an important component of any integrated management plan. Spatial planning tools aim to assist in finding cohesion between the demand for growth and development of infrastructure and the need for biodiversity conservation. With regards to estuarine management, the process of zonation is defined as “a process of analysing and allocating the spatial and temporal distribution of human activities and conservation areas in an estuary to achieve the vision and objectives”. Zonation and spatial planning typically allows for:

- Partitioning of activities within the estuary and its catchments thus permitting their existence without one activity precluding or conflicting with another.
- Identifying sensitive and small habitat fragments for protection.
- Focusing management activities in specific areas.
- Guiding future land/water uses and development activities in the area.

Figure 3 indicates the current boundaries for the Seekoei Estuary. Activities associated with the estuary include recreational fishing from the shoreline, wind surfing and birdwatching. No fishing is allowed from the causeway. The Seekoei Estuary is a small system and therefore a detailed zonation plan is unnecessary.



Figure 3 Map of the Seekoei Estuary showing boundaries and points of interest.

## 6 Recommended management priorities

Table 5 Recommended management priorities

**Management Priority 1:** Implement a mouth and maintenance management plan (see separate Mouth Management Plan document)

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
1.1 Implement Estuary Mouth and Maintenance Management Plan.	NEMA: Integrated Coastal Management Act.	Kouga Municipality.	Ensure safe crossing of the causeway (pedestrians and vehicles). Maintain salinity levels below lethal levels for the estuarine biota.	H

**Management Priority 2:** Upgrade the existing loop road between Paradise Beach and the Jeffrey’s Bay-Humansdorp link road to a tarred surface.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
2.1 Upgrade the existing loop road to a tarred surface.		Provincial Road Works.	Safe passageway for vehicles under all weather conditions.	H

**Management Priority 3:** Provide a new and alternative route for residents in Aston Bay and environs should the causeway across the Seekoei be flood-damaged or removed at some time in the future. The present and direct route to Jeffreys Bay may on occasions also become temporarily impassable.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
3.1 Construct a new road from Aston Bay and connecting with the present loop road from Paradise Beach to Humansdorp-Jeffreys Bay road.		Provincial Road Works/Kouga Municipality.	Safe passageway for vehicles and residents should the causeway and existing Aston Bay-Jeffreys Bay road become indefinitely closed to traffic.	H

**Management Priority 4:** Provide reasonable and safe public access between Paradise Beach and Aston Bay when using the causeway.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
4.1 Maintain and upgrade the road (if necessary) across the causeway.		Kouga Municipality.	Safe passageway for pedestrians and vehicles.	H
4.2 Install splash reflectors on either side of the causeway to reduce the incidence of splash overwash on the tarred surface..		Kouga Municipality.	Reduce splash across the road under conditions of high water levels and wind.	

**Management Priority 5:** Remove or partly remove the existing carpark and building (former swimming pool area) on the eastern side of the current mouth when the estuary is open.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
5.1 Remove (or partly remove) carpark and building (former swimming pool complex).	NEMA: Integrated Coastal Management Act.	Kouga Municipality.	Enable mouth channel to migrate eastwards to its former position across the sill under natural conditions.	H

**Management Priority 6:** Possible removal of the causeway to be considered after 2023.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
6.1 Possible removal of the causeway.	NEMA: Integrated Coastal Management Act.	Kouga Municipality	Final removal of the causeway must only be considered after 2023, and if Management Priorities 1-4 are implemented.	H

**Management Priority 7:** Establish Estuary and Wetland Management Committee for the Seekoei Estuary and wetlands.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
7.1 Establish Estuary and Wetland Management Committee.	NEMA: Integrated Coastal Management Act.	DEDEAT/Kouga Municipality.	Advise Kouga Municipality on the Health status of the Estuary and wetlands. Advise on appropriate action when necessary.	H

**Management Priority 8:** Restore best attainable level of ecological functioning to improve the health of the Seekoei Estuary.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
8.1 Review legality and capacity of existing dams in the Seekoei catchment.	National Water Act.	DWS.	Restore some baseflow to the estuary.	H

8.2 If required, implement legal procedures to ensure that landowners in the catchment adhere to water abstraction agreements.	National Water Act.	DWS.	As above.	
8.3 Review and improve the confidence level of the ecological reserve study done in 2006.	National Water Act.	DWS.	Provide more accurate information on the estuary freshwater requirements.	
8.4 Improve freshwater baseflows to the Seekoei estuary through “Compulsory licensing” of activities.	National Water Act.	DWS.	Improve the ecological health of the estuary.	
8.5 Initiate research programmes to identify and map the extent of alien species distribution in the wetlands and catchment.	NEMA: Integrated Coastal Management Act.	DWS.	First step in Improving the freshwater availability for the estuary.	
8.6 Develop an alien species eradication programme, guided by the results from 8.5 above.	NEMA: Integrated Coastal Management Act.	DWS	Increase the freshwater supply to improve the health of aquatic systems.	

**Management Priority 9:** Conserve and protect the remaining estuarine habitat within the Estuarine Functional Zone (EFZ).

<b>ACTION</b>	<b>RELEVANT LEGISLATION</b>	<b>RESPONSIBLE AUTHORITIES</b>	<b>PERFORMANCE INDICATOR</b>	<b>PRIORITY ALLOCATED (H/M/L)</b>
9.1 Conserve and protect remaining estuarine habitat within the EFZ.	NEMA: Integrated Coastal Management Act.	DEDEAT/Kouga Municipality.	Improve the health and sustainability of the aquatic ecosystems.	H
9.2 Develop a Conservation Plan for the Paradise Beach Wetlands.	NEMA: Integrated Coastal Management Act.	DEDEAT/ Kouga Municipality.	Improve the health and sustainability of the aquatic ecosystems.	
9.3 Research, and if necessary, restore the connectivity of wetlands in the estuary functional zone with the estuary.	NEMA: Integrated Coastal Management Act.	DEDEAT/ Kouga Municipality.	Restore connectivity and functioning of the aquatic water bodies.	

**Management Priority 10:** Develop monitoring programmes and encourage research on the Seekoei Estuary and wetlands.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
10.1 Develop monitoring programmes and encourage research.	NEMA: Integrated Coastal Management Act.	DEDEAT/Kouga Municipality.	Improve decision-making on actions required to improve the health of the estuary and wetlands	H

**Management Priority 11:** Promote local economic development through eco-tourism and recreation activities.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
<p>11.1 Promote local economic development and job creation. Promote the bird sanctuary as an attractive habitat for water birds particularly.</p> <p>11.2 Train local guides to lecture on the functioning of aquatic systems (e.g. the estuary, wetlands and their catchments). Included is the training of guides on bird identification and leading birding tours.</p>		<p>Kouga Municipality.</p> <p>Kouga Municipality.</p> <p>Kouga Municipality/DEDEAT</p>	<p>Improve well-being of residents.</p> <p>Promote local economic development.</p> <p>Create job opportunities.</p>	H



**Management Priority 12:** Promote education and awareness of the Seekoei Estuary and wetlands.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
12.1 Promote education and awareness of the Seekoei Estuary and wetlands.		Kouga Municipality	Improved public interest and a sense of value through an understanding of natural ecosystems, their connectivity and how they function. Encourages school groups and tourists to the area.	H

**Management Priority 13:** Develop partnerships between residents and municipal management authorities for the integrated management of the estuary, wetlands and their catchments.

ACTION	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITIES	PERFORMANCE INDICATOR	PRIORITY ALLOCATED (H/M/L)
13.1 Develop partnerships between residents and municipal management authorities.		Kouga Municipality,	Improved public interest and a sense of value and custodianship to promote the sustainability of the estuary, wetlands and their catchments. The interest of the community will also contribute to the optimal functioning of the Estuary and Wetland Management Committee.	H

## **7 Integrated monitoring plans**

The integrated monitoring plan for the Seekoei Estuary comprises of three primary categories. These categories include:

- 7.1 Resource monitoring
- 7.2 Compliance monitoring
- 7.3 Performance monitoring

### **7.1 Resource monitoring**

The resource monitoring component (Table 13) is aimed specifically towards the monitoring of ecological indicators. The ecological indicators are used to monitor the ecological state of the Seekoei Estuary. The requirements for the monitoring of the ecological indicators of the Seekoei Estuary have been guided by the Methods for the Determination of the Ecological Water Requirements Reserve for estuaries (DWA, 2013). Abiotic and biotic components were selected from this guideline. An annual report should be produced that summarises the results from the monitoring programme. This report should be made available to the public.

Should guidelines be exceeded, an alert must be forwarded to the Municipal Manager of the Kouga Municipality. In the case of water levels rising above monitoring thresholds (designed to avoid flooding of the causeway or damage to adjacent low-lying properties), an artificial breach of the mouth could be initiated. This situation will persist until the end of 2023 when monitoring data will guide the decision on the future of the causeway (in conjunction with acceptable outcomes of the Management Objectives listed in Section 4).

### **7.2 Compliance monitoring**

The compliance monitoring component aims to monitor the effectiveness of the implementation of the EMP by assessing the intensity and nature of the activities occurring within the Seekoei Estuary and will identify activities that are not compliant with the relevant legislation, policies and guidelines as described in the EMP (Table 14).

### **7.3 Performance monitoring**

The performance monitoring component is important when assessing the effectiveness of the overall implementation of the Seekoei EMP. The performance monitoring component will assess the effectiveness of the implementation of the EMP by determining whether the actions associated with each Management Objective have been achieved or not. The performance indicator allocated to each action will form the basis of the performance monitoring component (Table 15).

A summary of the integrated monitoring plan has been provided that indicates the activity/output, the indicator, the temporal scale, the target and the responsible authority. The summary for each monitoring component is provided below.

**Table 6 Resource Monitoring**

<b>Ecological component</b>	<b>Indicator</b>	<b>Spatial/temporal scale</b>	<b>Target</b>	<b>Responsible authorities</b>
Continuous Water Level Recorder (with ability to send remote signal to DWS and Municipality) to be installed.	Determine the water level in the estuary relative to the height of the buttress at the main causeway culvert. Refer to Figure 3 in the Mouth Management Plan Document.	Once a week or more frequently if a flood passes through the estuary.	Water level should not rise above +0.7 m MSL. This level is 30 cm below the top of the concrete buttress at the main causeway culvert. Short term target. Refer to Mouth Management Plan.	DEDEAT Kouga Municipality
Water quantity: freshwater inflows at the head of the Seekoei tributary – floods and baseflows.	Influences mouth dynamics and estuarine water level. Frequency of events.	Weekly, but flood inflows should trigger more frequent monitoring – alternate days if possible during a flood event.	Best attainable baseflow rates and monitoring of flood inflows.	DEDEAT Kouga Municipality
Water quality: freshwater inflows at the head of the Seekoei tributary.	Levels of sediments, nutrients and pollutants.	Monthly, or when a flood passes through.	No target applicable.	DWA
Water quality: bacterial contamination at the head of the Seekoei tributary and in wetland inflow canal to the estuary.	Coliform counts.	Monthly, or when a flood passes through.	To be determined.	Kouga Municipality
Water Quality: concentrations of water quality parameters.	Examples include: concentration of oxygen, nutrients, turbidity and salt content of the water.	At four sites along the estuary – head of each tributary. Just above present causeway and about 30 m to the east of the main culvert.	DWS water quality guidelines for the marine environment. Salt content of the estuary water should not exceed 45.	DEDEAT

		Measurements to be done monthly.		
Alien vegetation.	Area of cover.	Within 30 m on either side of all tributaries in the catchment every three years.	Remove all alien vegetation.	DWA, DEDEAT, Kouga Municipality
Maintenance of fish populations.	Catch per unit effort counts (CPUE).	Summer and winter at two sites along the estuary.	Fish population target not yet determined.	NMU, DEDEAT
Nursery function.	Sample small fish populations with appropriate gear.	As above.	Abundance and species present will inform success or otherwise of the mouth management programme.	NMU, DEDEAT
Co-ordinated Water Bird Counts (CWAC).	Identify species present together with specific counts of individual species.	Minimum of Mid-summer and mid-winter on the freshwater wetlands and estuary.	To be determined, linked to the overall health of the estuary.	To be arranged

**Table 14** The following uses/activities have been extracted from the Management Objectives and their respective actions to monitor the effectiveness of the implementation of the EMP.

<b>Use/Activity</b>	<b>Indicator</b>	<b>Temporal Scale</b>	<b>Target</b>	<b>Responsible authorities</b>
Determine the number and legality of freshwater storage reservoirs in the catchment.	Incidence of non-compliance.	Within 1 year of the adoption of the EMP.	Reduce incidence of non-compliance	DWA.
Restrict construction of new reservoirs or the abstraction of freshwater from the catchment and wetlands.	Compliance with freshwater supply to sustain ecological functioning of the estuary, wetlands and catchment.	Ongoing.	Halt the reducing supply of freshwater to the estuary.	DWA.
Removal of alien vegetation along water courses in the catchment.	Eradicate alien vegetation.	Ongoing.	Improve water runoff to the water courses.	DEDEAT, Kouga Municipality. Land Owners.
Install Continuous Water Level Recorder (with ability to send remote signal to DWS and Municipality).	Improve the accuracy of freshwater inflows to the estuary.	Within three months of the adoption of the EMP.	Improve confidence in the Ecological Reserve study	DEDEAT, Kouga Municipality.
Ensure that the Ecological Reserve Study is updated at the Intermediate Level.	Improve the Estuarine Health Index for the Seekoei estuary.	Within two years of the adoption of the EMP.	Improve ecological health Index of the Seekoei Estuary.	DEDEAT, Kouga Municipality.
Restrict additional development in the EFZ.	Number of applications for developments in the EFZ.	Ongoing upon adoption of the EMP.	No new developments in the EFZ.	DEDEAT, Kouga Municipality.

Ensure ongoing activities in the EFZ and catchment are compliant with existing legislation.	Sustained economic and social benefits for local communities.	Ongoing.	No non-compliance activities in the EFZ and catchment.	DEDEAT, Kouga Municipality, DWA.
Improved law enforcement associated with the estuary, bird sanctuary and wetlands.	No non-compliance.	Ongoing after adoption of the EMP.	Reduce incidence of non-compliance	DEDEAT, Kouga Municipality.
Water Quality monitoring.	No non-compliance.	Ongoing after adoption of the EMP.	Reduce incidence of non-compliance.	DDEAT, Kouga Municipality.

**Table 15 Performance monitoring to review the effectiveness of the overall implementation of the Seekoei EMP.**

<b>Management Output</b>	<b>Indicator</b>	<b>Temporal Scale</b>	<b>Target</b>	<b>Responsible Authorities</b>
Finalize and implement the Ecological Reserve Study on the Seekoei Estuary.	Report made available.	2 years.	Management of the freshwater reserve in line with the requirements of the Reserve Study.	DEDEAT, Kouga Municipality.
Conduct ongoing and detailed reviews on the monitoring plans as outlined and update if necessary.	Develop and implement an effective monitoring programme for the Seekoei Estuary.	1 year after the adoption of the EMP.	Provide a comprehensive data set that informs an effective estuary and mouth management programme.	DEDEAT, Kouga Municipality.
Update the EMP and MMP if deemed necessary following the revised Ecological Reserve Study and monitoring programmes.	Development of effective EMP and MMP programmes for the estuary.	Ongoing.	Improved benefits for local communities.	

Publish an annual monitoring report that summarises results for the physico-chemical and biological monitoring programme.	Annual reports made available to the public.	Annual.	Publish an annual report after initiation of the monitoring programme.	Kouga Municipality.
Ensure that future developments comply with existing legislation.	Proof of environmental Authorizations for all new developments in the EFZ.	Ongoing.	!00% compliance for all new developments in the EFZ.	DEDEAT.
Training of field guides for educational purposes.	Qualified guides in different fields of expertise, as outlined in Management Objective 11.	Within 18 months of the adoption of the EMP.	Contribute to an Environmental Education Programme.	Kouga Municipality.
Establish the Estuary and Wetland Management Committee.	Provide sound advice to the Municipal Manager's Office regarding action associated with the ESM and MMP.	Within 6 months of the adoption of the EMP.	Provide efficient and rapid recommendations to the Municipal Manager's Office.	Kouga Municipality.
Provide educational signage at public access points around the estuary and wetlands. Promote opportunities for research organizations.	Educational material for public benefit.  Promote multidisciplinary Research programmes.	Within 2 years.  Ongoing.	Educational benefits that promote the sustainability of the estuary and environs.  Generate new social, economic and environmental information on the Seekoei Estuary, wetlands and catchment.	Kouga Municipality, DEDEAT, Working for the Coast.  Kouga Municipality, DEDEAT, DWA, Water Research Commission. Tertiary Institutions.

Integrate the EMP and MMP into the Regional Coastal Management Plan.	Improve understanding of coastal ecosystems and how they integrate.	Ongoing.	Contribute to a holistic coastal management programme.	DEDEAT, DEA, DAFF, Kouga Municipality.
--	---	----------	--	--



## 8 Institutional capacity and arrangements

The estuary management protocol states that provincial and municipal coastal committees shall serve as the forums for monitoring the implementation of EMPs and reporting of progress and achievements relating to EMPs. Estuary forums are advisory bodies that ensure the effective facilitation and implementation of project plans for estuary management. These are essential to foster continuous stakeholder enjoyment. For the Seekoei Estuary it is recommended that a local Estuary and Wetland Management Committee (EWC) is established to ensure effective management of the Seekoei Estuary, adjacent wetlands and their respective catchments.

The Estuary and Wetland Management Committee must be representative of all stakeholders in the catchment and should be led by the Municipality. The following organizations or groups should be included on the committee:

- The provincial DEDEAT.
- The regional DWA.
- The Department of Agriculture.
- The local municipal authority (Kouga Municipality).
- The local Tourism Body.
- The Ratepayers' Association.
- Representatives from the Paradise Beach, Aston Bay and Tokyo Sexwale Communities.
- Representatives from Paradise Beach and Aston Bay Neighbourhood Watch Groups.
- The St Francis Bay Bird Club.
- An estuarine scientist from a Research or Tertiary Institution.
- Social and Economic specialists.

The forum should follow an adaptive strategy and advise on issues threatening the health of the aforementioned environments. This committee must be representative of all stakeholder groups including local, regional and national government Institutions. A qualified estuarine specialist should also be represented on the committee. This committee will act in an advisory capacity, reporting directly to the Municipal Manager of the Kouga Municipality. Reporting will follow conventional procedures with formal minutes submitted to the Municipal Manager. *Inter alia*, the following are suggested as key functions of the EWC:

- To review and interpret information gathered from the monitoring programme.
- To identify small and sensitive habitats for special protection, particularly if they support rare and endangered species.
- To review and report to the Municipal Manager on the health status of the estuary, mouth, wetlands and catchments on an ongoing basis.
- To monitor time lines identified under Management Objectives, Tables 5 – 17. Non-compliance situations must be formally documented as part of the meeting minutes submitted to the Municipal Manager.
- Monitor traffic and pedestrian use of the causeway with the view of contributing to final discussion (at the end of 2023) on the future of the causeway. Monitoring programmes to be partnered with Neighbourhood Watch groups.
- Advise on use of causeway by heavy transport vehicles (Delivery trucks) with the view of closing the causeway to such vehicles due to safety issues and damage to the road crossing,
- Advise on safety issues and possible improvements to the causeway with the view of reducing potential accidents.
- Develop threshold points that signify a specific level of alert (e.g. increasing estuary water levels may threaten the well-being of residents using the causeway. At a specific level, the causeway may be closed to traffic. Increasing salinity in the estuary may threaten the health of the biota is another example).

- Install DWS continuous water level recorder with alarm system that can alert relevant authorities to high water levels (e.g. as done on the Great Brak Estuary).
- These alerts must be electronically conveyed (i.e. transmitted to cell phone) to the relevant authority for the implementation of appropriate action.
- Provide early warning to residents of an approaching threat to human well-being - impending floods and heavy rains, storm seas etc,
- Foster a working relationship with local schools and research groups to provide opportunities for education and research.
- Review grievance issues centered on the estuary and causeway. If a grievance is not satisfactorily resolved by the EWC, communicate the issue to the relevant authority for further action. The grievance procedure is outlined below:

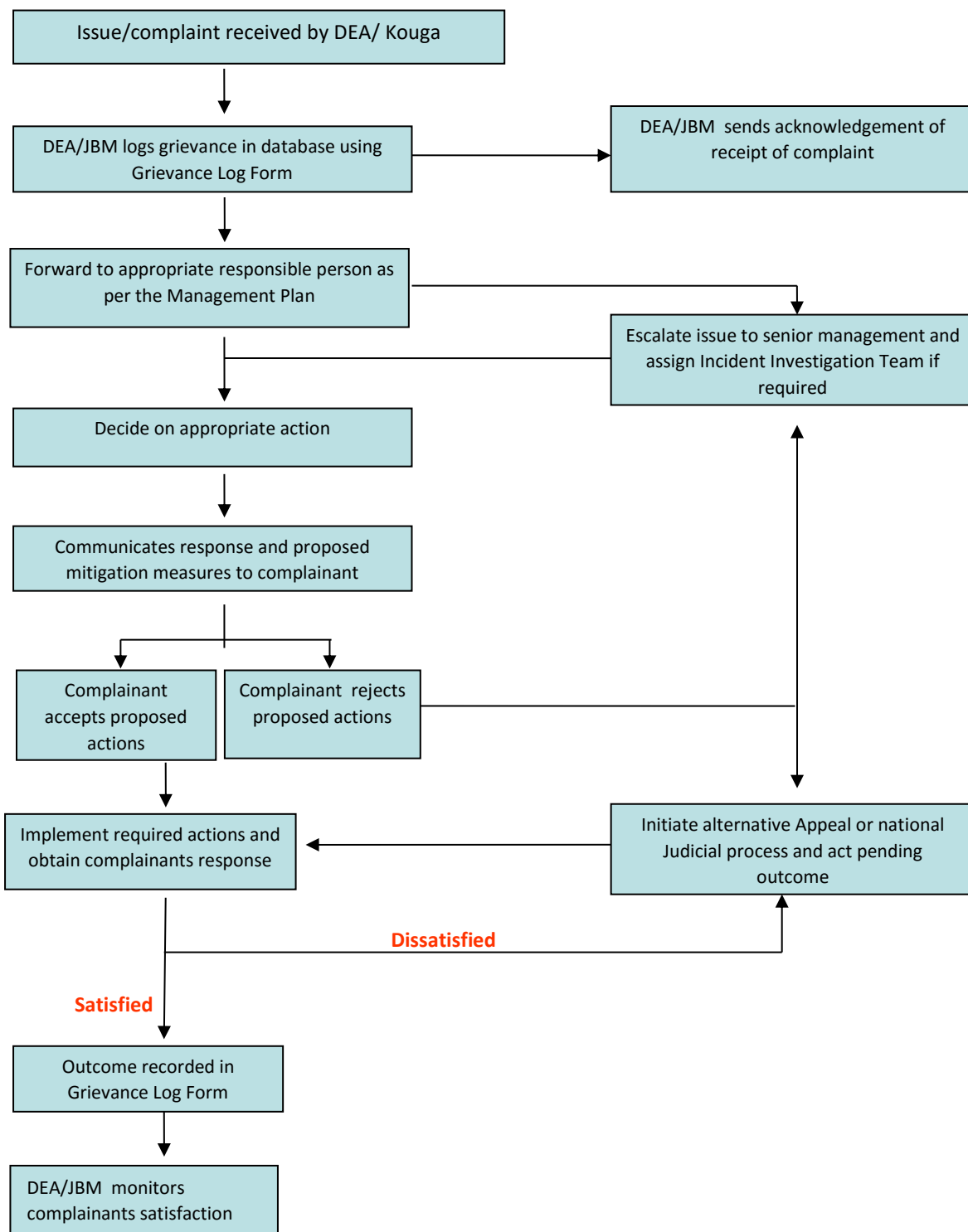
### **8.1 Grievance Procedure**

A Grievance Procedure should be implemented and followed for all grievances relating to the causeway as per the following steps:

- Receive and Log Grievance.
- Acknowledge Grievance.
- Assess and Prioritise Grievance and Forward to Relevant Department.
- Investigate and Resolve Grievance.
- Sign-off on Grievance.
- Monitor.

The grievance log forms should be kept at the Department of Environmental Affairs (DEA) in Jeffreys Bay as well as Kouga Municipality, an example of which is provided in Appendix 10.1.

**8.2 Summary of the Grievance Procedure**



### **8.3 Description of the Grievance Procedure**

- The grievance is received by a DEA/JBM by using the official Grievance Log Form and ensures that it is captured in a register in order to monitor actions taken against the grievance.
- The grievance resolution procedure should make it possible to receive a grievance in any appropriate format (written, verbal, telephonic, email, post etc). It is important that the process is easily accessible and un-intimidating to the complainant.

### **8.4 Acknowledge Grievance**

- Acknowledgment of receipt of the grievance as well as providing information on the proposed steps and the anticipated timeframes to resolving the grievance must be communicated to the complainant, in writing, within 5 days of receiving the grievance.

### **8.5 Forward Grievance to relevant responsible person**

- The grievance will be assigned to the responsible person as per the Management Plan.
- An Incident Investigation Team comprising of staff from the relevant department to which the grievance applies can be appointed.

### **8.6 Investigate and Resolve Grievance**

- The responsible person/Incident Investigation Team will be assigned within 10 days of receipt of the grievance. The team will be tasked with investigating the underlying cause of the grievance and action any changes required to internal systems to prevent a recurrence of a similar grievance. An Incident Investigation Report will be completed within 28 days.
- During the 28 days of investigation, the Grievance function will co-ordinate conflict resolution activities necessary to contain and resolve any actual or potential conflicts arising from the reported grievance.

### **8.7 Sign-off on Grievance**

- The Grievance function will seek sign-off from the complainant that the grievance has been resolved.
- In instances where the complainant is not satisfied with actions taken the grievance will either be escalated through the Grievance function to senior management and a decision will be taken either to implement supplementary actions or to consider initiating an appeal process.
- Following an appeal, the Grievance function will again approach the complainant to obtain sign-off on actions implemented in accordance with handed down instructions or judgements.
- All grievances to be signed off by senior members of staff.
- The senior staff member who signs off the complaint should have sufficient information about the topic to provide assurance. The person responsible for addressing the complaint should not be the same person as signs off the response.
- Once sign-off has occurred, this should be recorded in the Consultation Tracker.

### 8.8 Monitor

- The Grievance function will monitor the satisfaction of the complainant following sign-off (this will take place within 28 days of final sign-off).
- Any grievances not signed-off as resolved will be further investigated and the Grievance function will seek agreement from the complainant to maintaining contact in order to determine what further action is required to resolve the grievance.

Once the Estuarine Management Plan has been finalised and gazetted, the relevant Implementing Agents will be required to refine and finalise the proposed project plans related to the EMP.

## 9 References

- DWAF. 2006. Kromme/Seekoei Catchments Reserve Determination Study - Technical Component. Report No. RDM/K90/04/CON/0705, Department of Water Affairs, Pretoria.
- Esterhuysen, K. 1982. The Seekoei Estuary: Example of Disrupted Sedimentary Ecology. University of Port Elizabeth.
- Perissinotto, R., Stretch, D.D., Whitfield, A.K., Adams, J.B., Forbes, A.T. and Demetriades, N.T. 2010. Ecosystem functioning of temporarily open/closed estuaries in South Africa. In: Estuaries: Types, Movement Patterns and Climatical Impacts (Crane, J.R. & Solomon, A.E. eds). Nova Science Publishers, New York.
- Reddering, J.S.V. 1988a. Coastal and catchment basin controls on estuary morphology of the south-eastern Cape coast. *South African Journal of Science* **84**: 154-157.
- Reddering, J.S.V. 1988b. Prediction of the effects of reduced river discharge of the estuaries of the south-eastern Cape Province, South Africa. *South African Journal of Science* **84**: 726-730.
- Whitfield, A.K. 1992. A characterization of southern African estuarine systems. *Southern African Journal of Aquatic Sciences* **18**: 89-103.
- Whitfield, A. K. and M. N. Bruton. 1989. Some biological implications of reduced fresh water inflow into eastern Cape estuaries: a preliminary assessment. *South African Journal of Science* **85**: 691-695.

## 10 Appendices

### Appendix 10.1 Example of a Grievance form

SECTION 1: COMPLAINANT DETAILS			
Complaint Reference Number	Date Received	Recipient of Complaint	Manner in which Complaint was Identified / Submitted by Complainant
Name of Complainant / Organisation Registering Complaint (if not anonymous)			
Contact Details	Telephone Number	Physical and/or Postal Address	
SECTION 2: DETAILS OF COMPLAINT			
DEA/Kouga Person Responsible for Addressing the Complaint			
Time and Date Complaint Refers to			
Description of Complaint and / or Evidence of the Issue			
SECTION 3: ACTION TAKEN / REQUIRED			
Acknowledgement of Complaint Sent to Complainant? (Y / N)	Date When Acknowledgment Provided	Date Set for Resolution of Complaint	

<b>Description of Subsequent Action Taken (divide into Immediate Action and Subsequent Investigation, if applicable)</b>		
<b>Action Carried Out By Whom</b>	<b>Date of Completion</b>	<b>Method of feedback to Complainant</b>
<b>Complainant Response to Action</b>		
<b>SECTION 4: EFFECTIVENESS REVIEW</b>		
<b>How were the Actions Verified to be Effective at Resolving the Complaint?</b>		
<b>Approved By</b>		<b>Date</b>