



**Western Cape  
Government**  
Environmental Affairs and  
Development Planning

# **Gwaing River Estuary Draft Estuarine Management Plan**

2021

## DOCUMENT DESCRIPTION

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Gwaing River Estuary Draft Estuarine Management Plan (2021)

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**Disclaimer**

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



## EXECUTIVE SUMMARY

The National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008) (ICMA) was developed to facilitate the sustainable use and management of South Africa's coastline and coastal and estuarine resources. The ICMA requires that estuaries within South Africa are managed in a co-ordinated and efficient manner, and in accordance with the National Estuarine Management Protocol in GN No.341 10 May 2013 (NEMP), the National Coastal Management Programme (CMP) and the Western Cape CMP, which lay out specific objectives for management of the South African coastline, including estuaries. This document represents the first-generation Estuarine Management Plan (EMP) for the Gwaing River estuary developed under the auspices of the Western Cape Estuarine Management Framework and Implementation Strategy (EMFIS), a strategic project emanating from the provincial CMP, specifically priority area 7.

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

### Geographical Boundaries

The Gwaing River estuary is defined in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2019) as a small, temporarily closed estuarine system located within the warm temperate biogeographic region on the southern Cape coastline, approximately 3 km east of Herold's Bay, in the George Local Municipality (LM), Garden Route District. The size of the estuary, as defined by the estuarine functional zone (EFZ), is approximately 10.6 ha, extending over a length of approximately 1.4 km.

### Vision and Objectives

The following Vision for the Gwaing River estuary was proposed after input received during a public meeting held in November 2017 at Conville, George and adopted at a second public meeting in August 2018.

*The Gwaing River system and estuary is a natural and functional ecosystem that is preserved through effective integrated catchment management for the safe enjoyment of current and future generations*

The strategic objectives for the Gwaing River estuary are as follows:

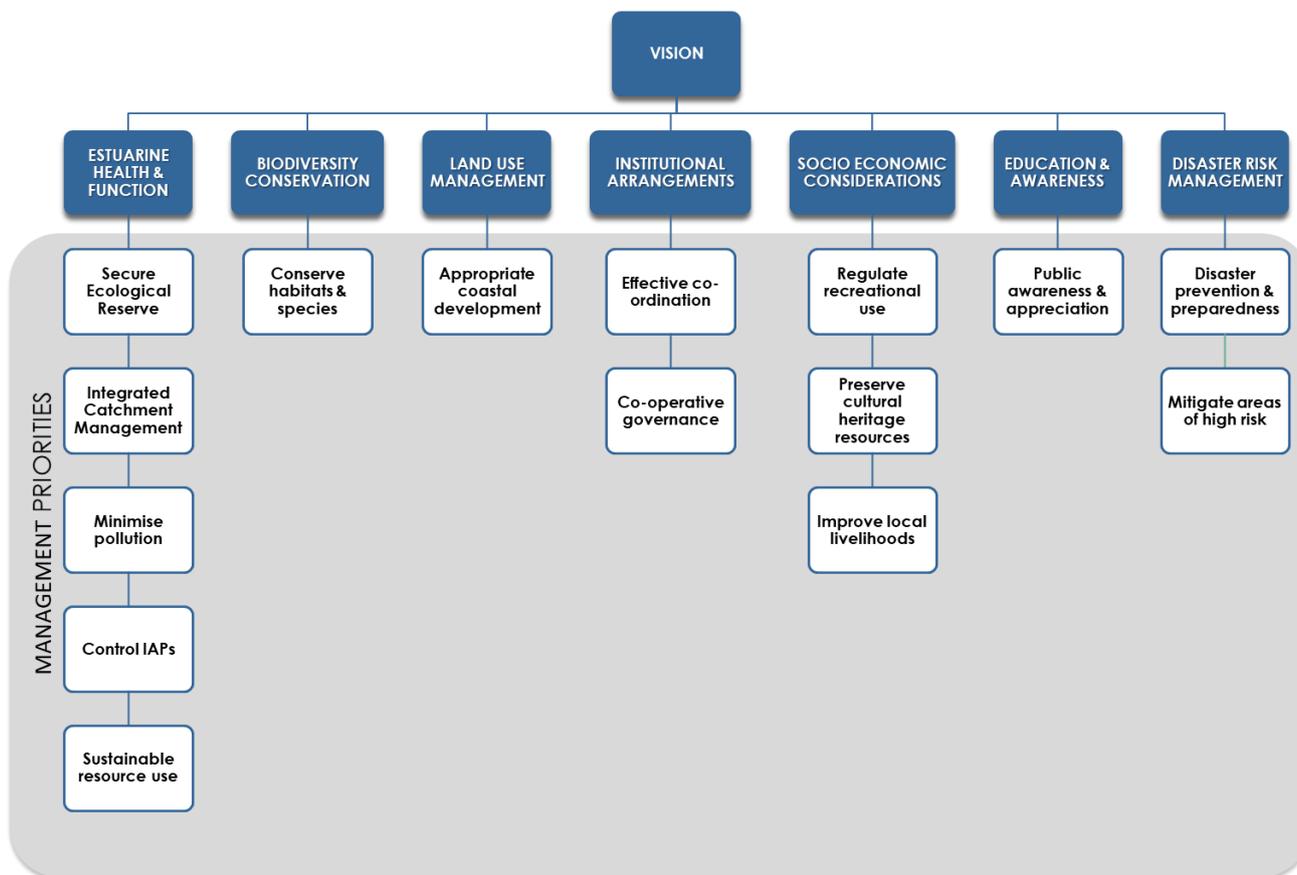
Sector / Category	Strategic Objective	Performance Indicator(s)	Priority
1 Estuarine Health and Function	The ecological health and natural functioning of the Gwaing River estuary: <ul style="list-style-type: none"><li>is maintained and safeguarded;</li></ul>	<ul style="list-style-type: none"><li>Maintain a B/C ecological condition</li><li>Ecological Reserve secured and implemented</li><li>Invasive alien plants are controlled</li></ul>	<b>HIGH</b>

		<ul style="list-style-type: none"> <li>its negative ecological trajectory and catchment impacts reversed;</li> <li>living resources are sustainably managed; and</li> <li>estuary nursery function protected</li> </ul>	<ul style="list-style-type: none"> <li>Pollution of the estuary is reduced</li> <li>Water quality impacts from the George WWTW are significantly reduced</li> <li>Water quality/pollution monitoring programme in place</li> <li>Ecological monitoring programme in place</li> <li>Resources utilised within legal limits; illegal activities controlled</li> <li>Ecological integrity of estuary improved and maintained</li> </ul>	
<b>2</b>	Biodiversity Conservation	The biodiversity of the Gwaing River estuary is conserved	<ul style="list-style-type: none"> <li>EMP incorporated into the George IDP and SDF</li> <li>EMP incorporated into the GRBR management plan</li> <li>Spatial zonation plan is adopted and enforced</li> <li>Compliance monitoring programme in place</li> <li>Environmental custodianship secured</li> </ul>	<b>MEDIUM</b>
<b>3</b>	Land-use and Infrastructure Planning and Development	Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised	<ul style="list-style-type: none"> <li>EMP included in all relevant planning documents</li> <li>All development and land use changes surrounding and within the EFZ comply with environmental legislation and environmental best practice / risk aversion approach</li> <li>Transformation of estuary prevented</li> <li>Reduced negative impacts from urban, agricultural and industrial activities</li> </ul>	<b>HIGH</b>
<b>4</b>	Institutional and Management Structures	The Gwaing River estuary is managed well through effective co-operative governance	<ul style="list-style-type: none"> <li>EMP is efficiently incorporated into the Garden Route BR Management Plan, George IDP and SDF</li> <li>Regional estuary advisory forum is established and meets regularly</li> <li>Estuarine bylaws are drafted by the George LM</li> <li>RMA is well capacitated and equipped for estuarine management</li> <li>Critical management networks are established</li> </ul>	<b>HIGH</b>
<b>5</b>	Socio-economic Considerations	Socio-economic benefits are enhanced and regulated to ensure sustainable use of the Gwaing River estuary and its resources	<ul style="list-style-type: none"> <li>Registered and well managed public boat launch site</li> <li>Estuary activities monitored, understood, and regulated</li> </ul>	<b>MEDIUM-HIGH</b>

			<ul style="list-style-type: none"> <li>• Cultural heritage resources preserved and well management</li> <li>• Increased livelihood opportunities</li> <li>• Environmental Protection and Infrastructure Programmes (EPIP) implemented and effective</li> <li>• Public access maintained</li> <li>• Safe for bathing</li> <li>• Illegal activities controlled</li> </ul>	
<b>6</b>	Education & Awareness	Members of society are sensitive to and aware of the value and importance of the Gwaing River estuary	<ul style="list-style-type: none"> <li>• Increase in number of research projects</li> <li>• Signage erected; information disseminated</li> <li>• Awareness programme developed and successfully implemented on an on-going basis</li> </ul>	<b>MEDIUM</b>
<b>7</b>	Disaster Risk Management	Potential risks that could impact the Gwaing River estuary are reduced (inclusive of climate change impacts)	<ul style="list-style-type: none"> <li>• Flood disaster management plan developed</li> <li>• Contingency plans in place for high risk areas / activities</li> <li>• Disaster impacts are timely and effectively mitigated</li> </ul>	<b>MEDIUM</b>

### Priority management objectives and associated activities

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



### Proposed Zonation of activities

In general, spatial zonation of activities on an estuary is used to prevent user conflict and to guide sustainable utilization of resources without degradation of the estuarine environment. A single zonation type is proposed for the Gwaing River estuary, a Quiet/Nature Access Zone. As a Quiet Zone, limited activities are encouraged in the EFZ, which are fortunately governed by the remote location and relatively small size of the system, and these activities are directed toward accessing and appreciating nature.

### Integrated monitoring plan

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

A basic water quality monitoring programme funded by the Breede-Gouritz Catchment Management Agency is currently in place for the Gwaing River estuary and all water quality data collected is submitted to the Garden Route (formally Eden) District. It is strongly recommended that this monitoring programme is maintained, and the data stored and utilised to inform the future management of the Gwaing River estuary. Recommendations for an integrated and coordinated water quality monitoring programme are provided in order to address possible threats and sources of pollution and health risks in the estuary.

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There are no known ecological monitoring or research programmes (e.g. fish or birds, etc.) currently being undertaken for the Gwaing River estuary. A resource monitoring programme based on the Reserve Determination Methods is thus provided.

Currently there is no compliance monitoring taking place on the Gwaing River estuary due to the remoteness of the estuary. Recommendations for compliance monitoring

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

### **Institutional Capacity and Arrangements**

This EMP should be regarded as a strategic plan that can guide the detailing of management actions and identification of implementing agents. While it does not specify the required resources (human and financial) required for effective management of the estuary, it does provide for their prioritisation. Co-management and effective governance is a vital aspect to the efficient and effective estuarine management and key role players in the management of the Gwaing River estuary are identified.

The 2021 NEMP identifies the **Department of Environmental Affairs & Development Planning (DEA&DP) (provincial environmental department)**, or its assigned representative, as the RMA responsible for the co-ordination of the implementation of the Gwaing River Estuary EMP. **It is noted that the NEMP allocates such responsibilities to the DEA&DP (provincial environmental department) unless agreement / or until agreement is reached with the respective body to undertake the coordination of the implementation process. Ultimately, the role of the RMA must be designated through formal signed agreement.**

Effective implementation of this EMP requires the augmentation of capacity specifically within the George LM, with the recommended appointment of a regional coastal and estuarine management co-ordinator within DEA&DP. This individual will play a critical co-ordinating role for all other implementing agencies and municipalities.

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

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

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

- Water quality impacts from the WWTW as well as agricultural run-off significantly reduced;
- Livelihoods related to the cultural heritage resources ('Standloper' caves) realised;
- Upgrade, development and control of existing public amenity and facilities;
- Safe bathing ensured;
- Continued effective management of public launch site;
- Invasive alien species eradication programme developed and implemented; and
- The DEA&DP to consider the appointment of a Regional estuarine management co-ordinator/champion within either DEA&DP or CapeNature, to support the RMA.

## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	BACKGROUND	1
1.2	PURPOSE OF THE EMP	2
1.3	MANDATE AND RESPONSIBILITIES OF THE RMA	3
1.4	STRUCTURE OF REPORT	4
<b>2</b>	<b>GEOGRAPHICAL BOUNDARIES</b>	<b>5</b>
<b>3</b>	<b>SYNOPSIS OF THE SITUATION ASSESSMENT</b>	<b>6</b>
<b>4</b>	<b>LOCAL VISION &amp; OBJECTIVES</b>	<b>9</b>
4.1	VISION	9
4.2	STRATEGIC OBJECTIVES	10
<b>5</b>	<b>PRIORITY MANAGEMENT OBJECTIVES AND ASSOCIATED ACTIVITIES</b>	<b>13</b>
5.1	ESTUARINE HEALTH AND FUNCTION	15
5.2	BIODIVERSITY CONSERVATION	22
5.3	LAND-USE AND INFRASTRUCTURE PLANNING AND DEVELOPMENT	24
5.4	INSTITUTIONAL AND MANAGEMENT STRUCTURES	26
5.5	SOCIO-ECONOMIC CONSIDERATIONS	30
5.6	EDUCATION & AWARENESS	33
5.7	DISASTER RISK MANAGEMENT	34
<b>6</b>	<b>PROPOSED SPATIAL ZONATION</b>	<b>36</b>
6.1	INTRODUCTION	36
6.2	HABITAT ZONES	36
6.3	LEGISLATED COASTAL BOUNDARIES AND BUFFER ZONES	37
6.3.1	Estuarine Functional Zone	37
6.3.2	Coastal Protection Zone and proposed Coastal Management Line	38
6.3.3	Environmental Impact Assessment regulatory line	39
6.4	ZONATION OF ACTIVITIES	40
6.4.1	Current zonations and uses	40
6.4.2	Proposed spatial zonation	43
6.4.3	Areas requiring rehabilitation	44
<b>7</b>	<b>INTEGRATED MONITORING PLAN</b>	<b>45</b>
7.1	RESOURCE MONITORING	45
7.1.1	Current Resource Monitoring	45
7.1.2	Recommended Resource Monitoring Programmes	45
7.1.3	Resource Quality Objectives / Ecological Specifications	45
7.1.4	Recommended Pollution Monitoring Programme	46
7.2	COMPLIANCE MONITORING	46
7.2.1	Current Compliance Monitoring	46
7.2.2	Recommended Compliance Monitoring	47
7.3	PERFORMANCE MONITORING (REVIEW & EVALUATION)	48
<b>8</b>	<b>INSTITUTIONAL CAPACITY &amp; ARRANGEMENTS</b>	<b>50</b>
8.1	KEY ROLE PLAYERS	50
8.2	RESPONSIBLE MANAGEMENT AUTHORITY	50
8.3	ESTUARY ADVISORY FORUM	51

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8.4	GOVERNMENT DEPARTMENTS AND ORGANS OF STATE	52
8.4.1	Project Plans for Implementation	53
<b>9</b>	<b>RECOMMENDATIONS AND CONCLUSION</b>	<b>54</b>
<b>10</b>	<b>REFERENCES</b>	<b>55</b>
	<b>APPENDIX 1: RECOMMENDED MONITORING PROGRAMMES</b>	<b>57</b>
	<b>APPENDIX 2: ECOLOGICAL SPECIFICATIONS</b>	<b>63</b>
	<b>APPENDIX 3: PERFORMANCE MONITORING PLAN</b>	<b>66</b>
	<b>APPENDIX 4: PROJECT PLAN TEMPLATE</b>	<b>71</b>

## TABLE OF FIGURES

Figure 1: Location of the Gwaing River estuary within the George Local Municipality	1
Figure 2: A framework for integrated estuarine management in South Africa (DEA, 2015)	2
Figure 3: Geographical boundaries of the Gwaing River estuary EFZ showing the 5 m topographical contour and the 2018 NBA (SANBI 2019) EFZ boundary	5
Figure 4: Sectors or categories of issues relevant to the management of the Gwaing River estuary	10
Figure 5: Summary of priority management objectives per management sector	14
Figure 6: Habitats identified in the Gwaing River estuary	37
Figure 7: Coastal boundaries of the Gwaing River estuary and risk projections (WCG, 2015)	39
Figure 8: Extracts from the George Municipal Town Planning Scheme	41
Figure 9: Key role players for the management of the Gwaing river estuarine system	51

## LIST OF TABLES

Table 1: Geographical boundaries of the Gwaing River estuary	5
Table 2: Strategic Objectives for management of the Gwaing River estuary, their indicators and level of priority	11
Table 3: SWOT Analysis	13
Table 4: Management Objectives and Actions for Estuarine Health and Function (includes water quantity and quality as well as utilisation of living resources)	15
Table 5: Management Objectives and Actions for Biodiversity Conservation	22
Table 6: Management Objectives and Actions for Land-use and Infrastructure Planning and Development	24
Table 7: Management Objectives Actions for Institutional and Management Structures	26
Table 8: Management Objectives and Actions for Socio-economic Considerations	30
Table 9: Management Objectives Actions for Education & Awareness	33
Table 10: Management Objectives and Actions for Disaster Risk Management	34
Table 11: Current zonations and activities occurring in and/or adjacent to the Gwaing River estuary	42
Table 12: Proposed zonation prescriptions for the Gwaing River estuary	44
Table 13: Recommended compliance monitoring requirements	48
Table 14: Generic baseline surveys to improve confidence in the preliminary reserve determination of estuaries (Priority components are highlighted) (DWS, 2015)	57
Table 15: Recommended long-term monitoring programme for the Gwaing Estuary (priority components are highlighted) (DWS, 2015)	60
Table 16: EcoSpecs and Thresholds of Potential Concern for the Gwaing Estuary (Category B/C) (DWS, 2015; 2018)	63
Table 17: Recommended Performance Monitoring Plan for the management of Gwaing River estuary	66

amsl	Above mean sea level
BGCMA	Breede-Gouritz Catchment Management Agency
CARA	Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
CFR	Cape Floristic Region
CMA	Catchment Management Agency
CML	Coastal Management Line
CMP	Coastal Management Programme
CMS	Catchment Management Strategy
CSIR	Council for Scientific and Industrial Research
DALRRD	Department of Agriculture, Land Reform and Rural Development
DAFF	Department of Agriculture, Forestry and Fisheries (now DALRRD/ DEFF)
DEA	Department of Environmental Affairs (now DEFF)
DEA&DP	Western Cape Government's Department of Environmental Affairs & Development Planning
DEFF	Department of Environment, Forestry and Fisheries
DEFF: WftC	Department of Agriculture, Forestry and Fisheries: Working for the Coast
DEFF: WfW	Department of Agriculture, Forestry and Fisheries: Working for Water
DIN	Dissolved Inorganic Nitrogen
DIP	Dissolved Inorganic Phosphorous
DM	District Municipality
DMA	Disaster Management Act (Act No. 57 of 2002)
DO	Dissolved Oxygen
DST	Department of Science and Technology
DWS	Department of Water and Sanitation (formerly DWAF)
EAF	Estuary Advisory Forum
EcoSpecs	Ecological Specifications
EFZ	Estuarine Functional Zone
EIA	Environmental Impact Assessment
EIS	Estuary Importance Score
EMFIS	Estuarine Management Framework and Implementation Strategy
EMP	Estuarine Management Plan(s)
EPIP	Environmental Protection and Infrastructure Programmes
EWR	Environmental Water Requirement
GRBR	Garden Route Biosphere Reserve
HWM	High Water Mark
I&APs	Interested and Affected Parties
IAPs	Invasive Alien Plants
ICMA	National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008)
IDP	Integrated Development Plan
LM	Local Municipality
LUPA	Land Use Planning Act (Act No. 3 of 2014)
MAR	Mean Annual Runoff
MEC	Member of the Executive Council
MLRA	Marine Living Resources Act (Act No. 18 of 1998) as amended
MOU	Memorandum of Understanding
MSA	Municipal Systems Act (Act No. 32 of 2000)
NBA	National Biodiversity Assessment
NEM: BA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM: PAA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEM: WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMP	National Estuarine Management Protocol (2013)
NTU	Nephelometric Turbidity Units
NWA	National Water Act (Act No. 36 of 1998)
PAES	Protected Area Expansion Strategy

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PES	Present Ecological State
RDM	Resource Directed Measures
REC	Recommended Ecological Category
RMA	Responsible Management Authority
RQO(s)	Resource Quality Objectives
SAHRA	South African Heritage Resources Agency
SAMSA	South African Maritime Safety Association
SAR	Situation Assessment Report
SDF	Spatial Development Framework
SMA	Special Management Area
SUDS	Sustainable Drainage Systems
SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
TPC	Threshold of Potential Concern
TPS	Town Planning Scheme
WQ	Water Quality
WRC	Water Research Commission
WUA	Water Users Association
WUL	Water Use Licence
WWTW	Wastewater Treatment Works

# 1 INTRODUCTION

## 1.1 Background

The National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008) (ICMA) was developed to facilitate the sustainable use and management of South Africa's coastline and coastal and estuarine resources. The ICMA requires that estuaries within South Africa are managed in a co-ordinated and efficient manner, and in accordance with the 2013 National Estuarine Management Protocol in GN No. 341 dated 10 May 2013 (hereafter referred to as the NEMP), the National Coastal Management Programme dated 2014 (CMP) and the Western Cape CMP dated March 2016, which lay out specific objectives for management of the South African coastline, including estuaries.

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

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

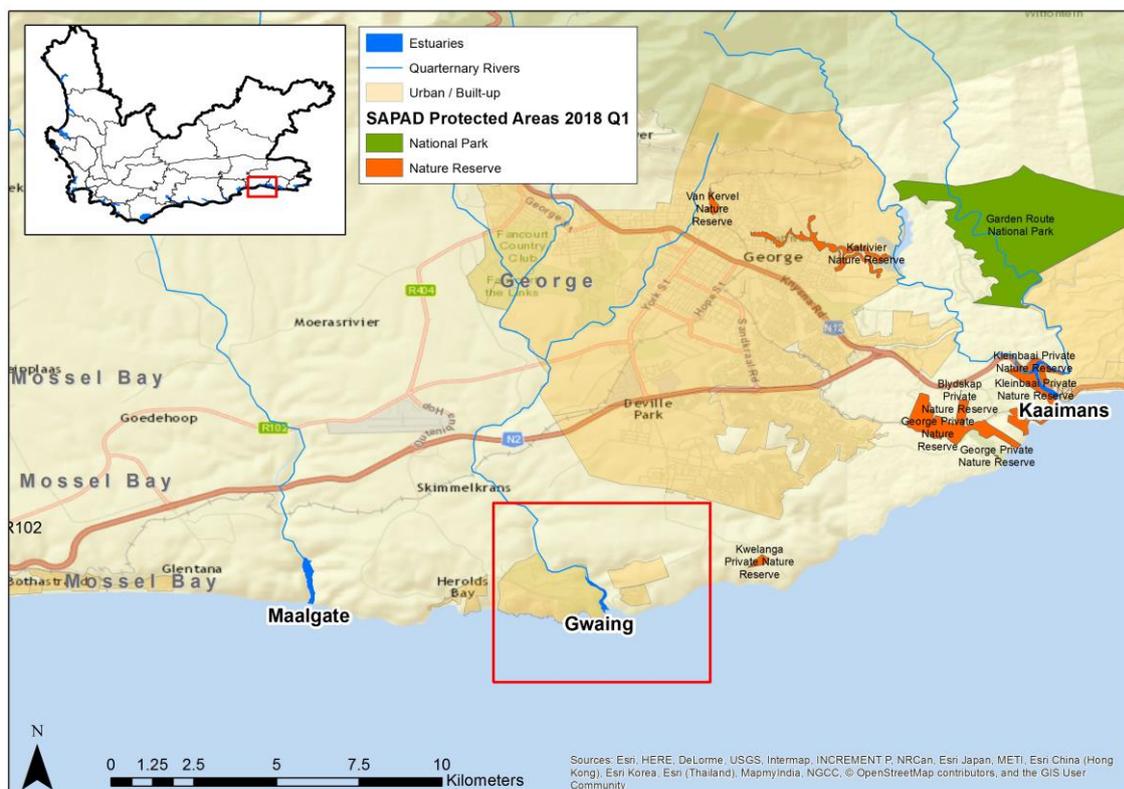
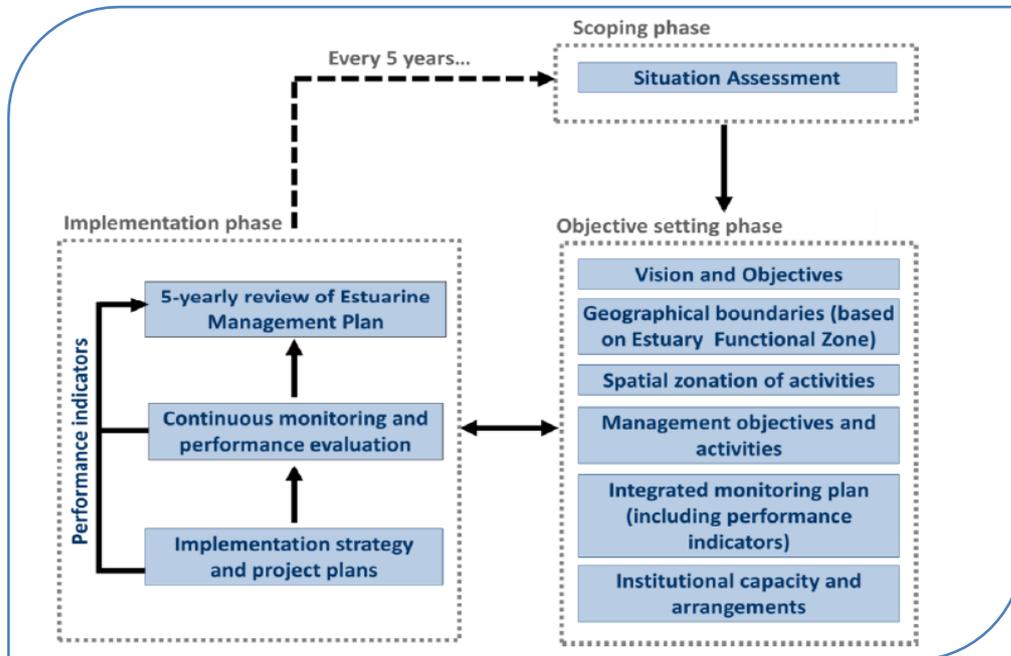


Figure 1: Location of the Gwaing River estuary within the George Local Municipality

## 1.2 Purpose of the EMP

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



**Figure 2: A framework for integrated estuarine management in South Africa (DEA, 2015)**

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

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

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## 1.3 Mandate and responsibilities of the RMA

The co-ordination of the implementation of the EMP vests with the RMA as per the NEMP. One of the strategic objectives of this EMP is to promote and facilitate the cooperative governance relationship between the RMA and an existing or new estuary advisory forum (EAF), or any other supporting structures or organisations with estuarine-related duties and functions.

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

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

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

Section 5: *"...authorities are **responsible for the development of EMPs and coordination of the implementation process...**"*

Section 5(e): *"The identified responsible management authority to develop the EMP needs to **budget accordingly for the development of these plans.**"*

Section 8(1): *"The responsible management authority developing an EMP must **actively engage all the relevant stakeholders** including government departments, non-government organisations and civil society in the development and implementation of the EMP."*

Section 9.1(1) and 9.2: *"...it **must obtain formal approval** for the EMP..." and "Once approved...the EMP shall be... **Integrated..**" and "**incorporated** into the Provincial Coastal Management Programme."*

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

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

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

## 1.4 Structure of Report

This report is structured as follows:

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

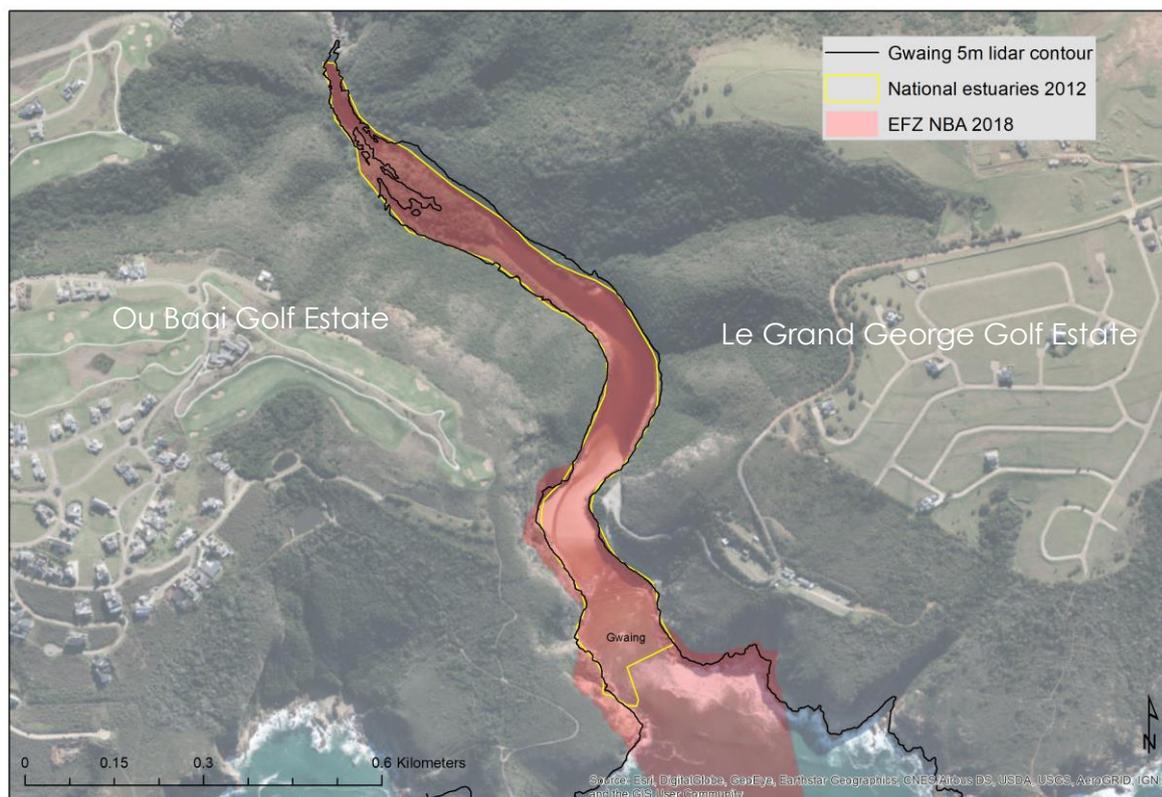
## 2 GEOGRAPHICAL BOUNDARIES

The Gwaing River estuary is defined in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2019) as a small, temporarily closed estuarine system, located within the warm temperate biogeographic region on the southern Cape coastline, approximately 3 km east of Herold's Bay, in the George Local Municipality (LM), Garden Route District.

The size of the estuary, as defined by the estuarine functional zone (EFZ), is approximately 10.6 ha, extending over a length of approximately 1.4 km. The geographical boundaries of the Gwaing River estuary, delineating the EFZ, are provided in Table 1 and illustrated in Figure 3.

**Table 1: Geographical boundaries of the Gwaing River estuary**

<b>Downstream boundary:</b>	-34.056002° S, 22.434204° E (estuary mouth)
<b>Upstream boundary:</b>	-34.046793° S, 22.428758° E (head of estuary)
<b>Lateral boundaries:</b>	Approximated by the boundary of estuarine vegetation along each bank, and informed by the 5 m above Mean Sea Level (amsl) contour in the upper reaches



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

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### 3 SYNOPSIS OF THE SITUATION ASSESSMENT

The Gwaing River estuary is defined in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2019) as a small, temporarily closed estuarine system (SANBI, 2018) situated approximately 3 km east of Herold's Bay in the George Local Municipality (LM).

#### **Catchment Characteristics**

The Gwaing River estuary falls within the George Local Municipality (LM), which experiences a warm and temperate climate. Average daily temperatures range from 18.2°C in winter to 27.6°C in summer. Highest rainfall occurs during the month of March (average 78 mm), while the lowest rainfall occurs in June (average 36 mm). The underlying geology of the Gwaing River estuary comprises Kaaimans Group granites and granodiorites of the Maalgaten granites. A thin band of gritty quartzites, phyllite and schist of Skaapkop member which runs in an east-west orientation can be found along the lower reaches of the river, with the estuary again underlain by granites and granodiorites of the Maalgaten.

Land use in the broader municipal area include fertile farmlands and timber plantations along the coastal plain, fruit orchards in the Langkloof and arid grazing areas in the Little Karoo. Almost half (49.5%) of the George LM has been transformed, of which 22.9% is under intensive agriculture and 14.2% consists of plantations. Extensive golf estates developments are situated on both the eastern and western banks of the estuary, with urban development (Pacaltsdorp) and agricultural activities dominating in the catchment.

#### **Abiotic Function**

The Gwaing River estuary is a small temporarily closed estuary that lies within a steep valley incised into the coastal plain and is about 1.4 km long. Marine sediments dominate the mouth, causing mouth closure at times. The Mean Annual Runoff (MAR) to the estuary has been slightly reduced by 8% to  $35.09 \times 10^6 \text{ m}^3$  from its natural State. The estuary is a blackwater system. Although very little information is available on the water quality of the system, nutrient enrichment is expected due to runoff from farming urban stormwater, the George Wastewater Treatment Works (WWTW) and the surrounding golf estates.

#### **Biotic Function**

There is very little information available on the biotic components of the Gwaing River estuary. There is little habitat for colonization by estuarine vegetation. At low tide large areas of rock and sand become exposed. Some salt marsh species have been recorded on the rocky substrate, and reeds are restricted to thin fringes flanking the water. Invasive trees are present along the banks of the estuary, mostly *Acacia cyclops*. No microalgae, invertebrate or bird information is available for the system. Fish data on the Gwaing Estuary is limited to a "once-off" survey in 1994 during which seven species were caught. Four of these were obligate estuary-dependent species requiring estuaries for at least the first year of life. Partially estuarine-dependent species were represented by one individual, white seacatfish *Galeichthys feliceps*. The marine opportunistic species, *Liza richardsonii* dominated the community assemblage,

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contributing 96% of the catch. There were no estuarine residents caught. Based on age assemblages of the fish surveyed, it is evident the estuary serves as a nursery for some species and the low numbers may have just been a result of recruitment variability.

### ***Ecological Health Status, Importance, and Recommended Future State***

The health condition (also referred to as the Present Ecological State (PES)) of an estuary is typically defined based on the similarity of its current condition to an estimated natural condition. Both biotic and abiotic variables are considered in this process. The health condition is then described using six Ecological Categories, ranging from natural (A) to critically modified (F). The overall ecological health of the Gwaing River estuary is in a B/C Category.

Based on an assessment of its biodiversity importance, the Gwaing River estuary does not form part of the core set of priority estuaries in need of protection to achieve biodiversity targets and has an Estuary Importance Score (EIS) of 10 (low to moderate importance). The Recommended Ecological Condition (REC) of the Gwaing River estuary is a Category B/C estuary. However, the historical Environmental Water Requirement (EWR) studies have concluded that the system maybe further degraded to a Category C to accommodate water resource development in the region (e.g. additional abstraction and/or increase in the discharge of wastewater). The ultimate overall condition the Gwaing River estuary should be managed to in the future would be determined by the Breede/Gouritz Water Management Area Water Resource Classification study. However, it is noted that the 2018 NBA (SANBI 2019) suggests a Category B.

### ***Important Ecosystem Goods and Services***

Estuaries are recognised as some of the most productive types of ecosystems worldwide, and provide a wide range of opportunities and benefits, contributing both indirectly to the economy as well as providing social benefit. Estuarine habitats and the species they support provide a host of important ecosystem services. Due to its small size, the services supplied by the Gwaing River estuary are generally rated as low.

### ***Impacts and Potential Impacts***

Due to the developed nature of its surroundings and catchment, the major impact on the estuary is a deterioration in water quality. Water quality in the estuary is largely affected by the run-off from golf estates, urban developments and agricultural activities in the catchment. There is also a cement factory and wastewater treatment plant which discharge wastewater into the catchment.

### ***Socio-economic Context***

The George LM is one of seven local municipalities situated within the Garden Route District Municipality (DM). It has an estimated total population of 208 238 people (Stats SA, 2016) and has an average growth rate of 2.59% (Stats SA, 2011). Population density is an estimated 40.1 persons/km<sup>2</sup> (Stats SA, 2016). The Gwaing River estuary falls within ward 23 of the George LM. The closest settlement to the Gwaing River estuary is Herold's Bay, situated 3 km west of the estuary.

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The Gwaing River estuary provides some value to the tourists visiting the nearby camping site and is also of socio-economic benefit to the golf estates, in terms of aesthetic appeal. The estuary and its undeveloped surrounds is also identified as a Critical Biodiversity Area and links the coastal corridor with the river corridor. Potential exists for custodianship with neighbouring landowners as well as heritage and tourism opportunities relating to the 'strandloper' caves. A final important social issue relates to formal access which is currently via a dirt road and a gated estate. The existing camping site and facilities are reported to be 'captured' by users displaying unsocial and generally unacceptable behaviour.

### ***Legislative Instruments and relevant Strategies, Plans and Policy Directives***

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

### ***Opportunities and Constraints***

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis for the management of the Gwaing River estuary was undertaken. One of the strengths of the Gwaing River Estuary is that it falls within the Outeniqua Sensitive Coastal Area, which provides a further level of protection against development. Other strengths include existing public amenity and facilities as well as its recreational and aesthetic value.

Weaknesses include having very limited information on the system, poor water quality, the prevalence of invasive alien plant species and generally anti-social behaviour of visitors.

Opportunities for positive change include the removal of alien vegetation and capitalising on existing facilities, once reinstated, as well as both the heritage resources as well as unique rock formations. Threats preventing this include the system being targeted for further water resources development, the continued discharge of wastewater from the Wastewater Treatment Plant, further development in the catchment as well as continued pressure to privatise access to the mouth.

The Gwaing River estuary was also not included on the list of estuaries that require full or partial protection in order to meet South Africa's biodiversity targets for conservation of estuarine biodiversity

There is very limited water quality data available for the catchment. There are also significant information gaps with regard to baseline information available on the biophysical aspects of the Gwaing River estuary. A detailed ecological monitoring programme is included.

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## 4 LOCAL VISION & OBJECTIVES

### 4.1 Vision

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

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

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

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

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

The following Vision for the Gwaing River estuary was proposed after input received during a public meeting held in November 2017 at Conville, George<sup>1</sup> and adopted at a second public meeting in August 2018<sup>2</sup>.

***The Gwaing River system and estuary is a natural and functional ecosystem that is preserved through effective integrated catchment management for the safe enjoyment of current and future generations***

The vision highlights the following aspects of the estuary that are valued:

- The desire to preserve the estuary and its associated river system in a healthy and functional state;
- The natural state of the estuary, inferring an unimpacted landscape and biodiversity;

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<sup>1</sup> Minutes of the stakeholder meeting for the Maalgate and Gwaing estuaries, 13 November 2017, Conville Community Centre, Conville, George.

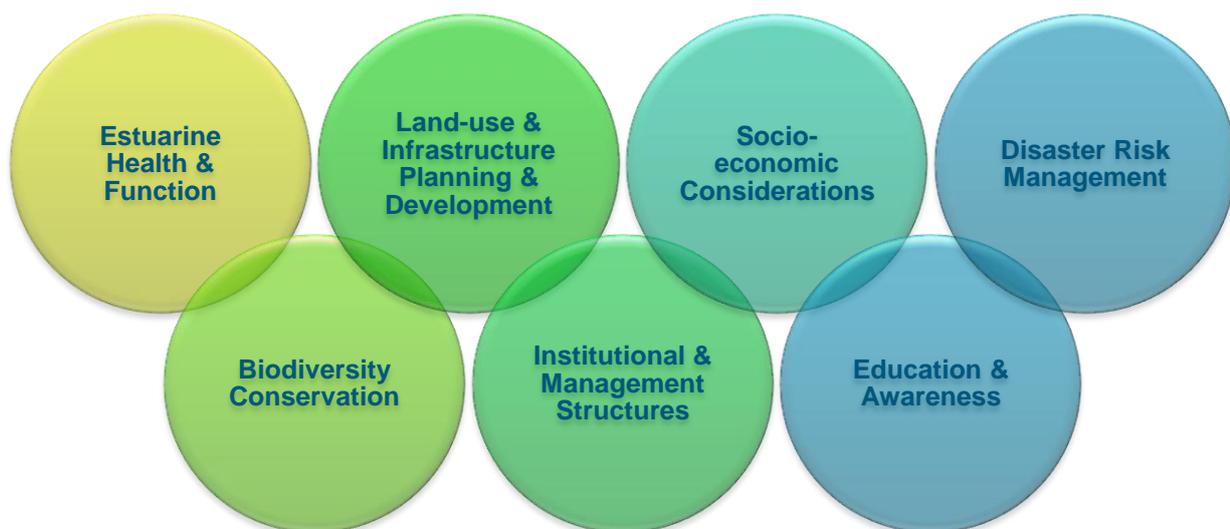
<sup>2</sup> Minutes of the stakeholder meeting for the Maalgate, Gwaing and Kaaimans estuaries, 28 August 2018, Conville Community Centre, Conville, George.

- The linkage between catchment activities and the estuary;
- The need to manage catchment activities in order to preserve the longevity of the estuary; and
- The value of the estuary as a place of recreation and enjoyment for the community.

## 4.2 Strategic Objectives

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

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



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

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

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

Sector / Category	Strategic Objective	Performance Indicator(s)	Priority
1	Estuarine Health and Function  The ecological health and natural functioning of the Gwaing River estuary: <ul style="list-style-type: none"> <li>• is maintained and safeguarded;</li> <li>• its negative ecological trajectory and catchment impacts reversed;</li> <li>• living resources are sustainably managed; and</li> <li>• estuary nursery function protected</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain a B/C ecological condition</li> <li>• Ecological Reserve secured and implemented</li> <li>• Invasive alien plants are controlled</li> <li>• Pollution of the estuary is reduced</li> <li>• Water quality impacts from the George WWTW are significantly reduced</li> <li>• Water quality/pollution monitoring programme in place</li> <li>• Ecological monitoring programme in place</li> <li>• Resources utilised within legal limits; illegal activities controlled</li> <li>• Ecological integrity of estuary improved and maintained</li> </ul>	<b>HIGH</b>
2	Biodiversity Conservation  The biodiversity of the Gwaing River estuary is conserved	<ul style="list-style-type: none"> <li>• EMP incorporated into the George IDP and SDF</li> <li>• EMP incorporated into the GRBR management plan</li> <li>• Spatial zonation plan is adopted and enforced</li> <li>• Compliance monitoring programme in place</li> <li>• Environmental custodianship secured</li> </ul>	<b>MEDIUM</b>
3	Land-use and Infrastructure Planning and Development  Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised	<ul style="list-style-type: none"> <li>• EMP included in all relevant planning documents</li> <li>• All development and land use changes surrounding and within the EFZ comply with environmental legislation and environmental best practice / risk aversion approach</li> <li>• Transformation of estuary prevented</li> <li>• Reduced negative impacts from urban, agricultural and industrial activities</li> </ul>	<b>HIGH</b>
4	Institutional and Management Structures  The Gwaing River estuary is managed well through effective co-operative governance	<ul style="list-style-type: none"> <li>• EMP is efficiently incorporated into the Garden Route BR Management Plan, George IDP and SDF</li> </ul>	<b>HIGH</b>

			<ul style="list-style-type: none"> <li>• Regional estuary advisory forum is established and meets regularly</li> <li>• Estuarine bylaws are drafted by the George LM</li> <li>• RMA is well capacitated and equipped for estuarine management</li> <li>• Critical management networks are established</li> </ul>	
<b>5</b>	Socio-economic Considerations	Socio-economic benefits are enhanced and regulated to ensure sustainable use of the Gwaing River estuary and its resources	<ul style="list-style-type: none"> <li>• Registered and well managed public boat launch site</li> <li>• Estuary activities monitored, understood, and regulated</li> <li>• Cultural heritage resources preserved and well management</li> <li>• Increased livelihood opportunities</li> <li>• Environmental Protection and Infrastructure Programmes (EPIP) implemented and effective</li> <li>• Public access maintained</li> <li>• Safe for bathing</li> <li>• Illegal activities controlled</li> </ul>	<b>MEDIUM-HIGH</b>
<b>6</b>	Education & Awareness	Members of society are sensitive to and aware of the value and importance of the Gwaing River estuary	<ul style="list-style-type: none"> <li>• Increase in number of research projects</li> <li>• Signage erected; information disseminated</li> <li>• Awareness programme developed and successfully implemented on an on-going basis</li> </ul>	<b>MEDIUM</b>
<b>7</b>	Disaster Risk Management	Potential risks that could impact the Gwaing River estuary are reduced (inclusive of climate change impacts)	<ul style="list-style-type: none"> <li>• Flood disaster management plan developed</li> <li>• Contingency plans in place for high risk areas / activities</li> <li>• Disaster impacts are timely and effectively mitigated</li> </ul>	<b>MEDIUM</b>

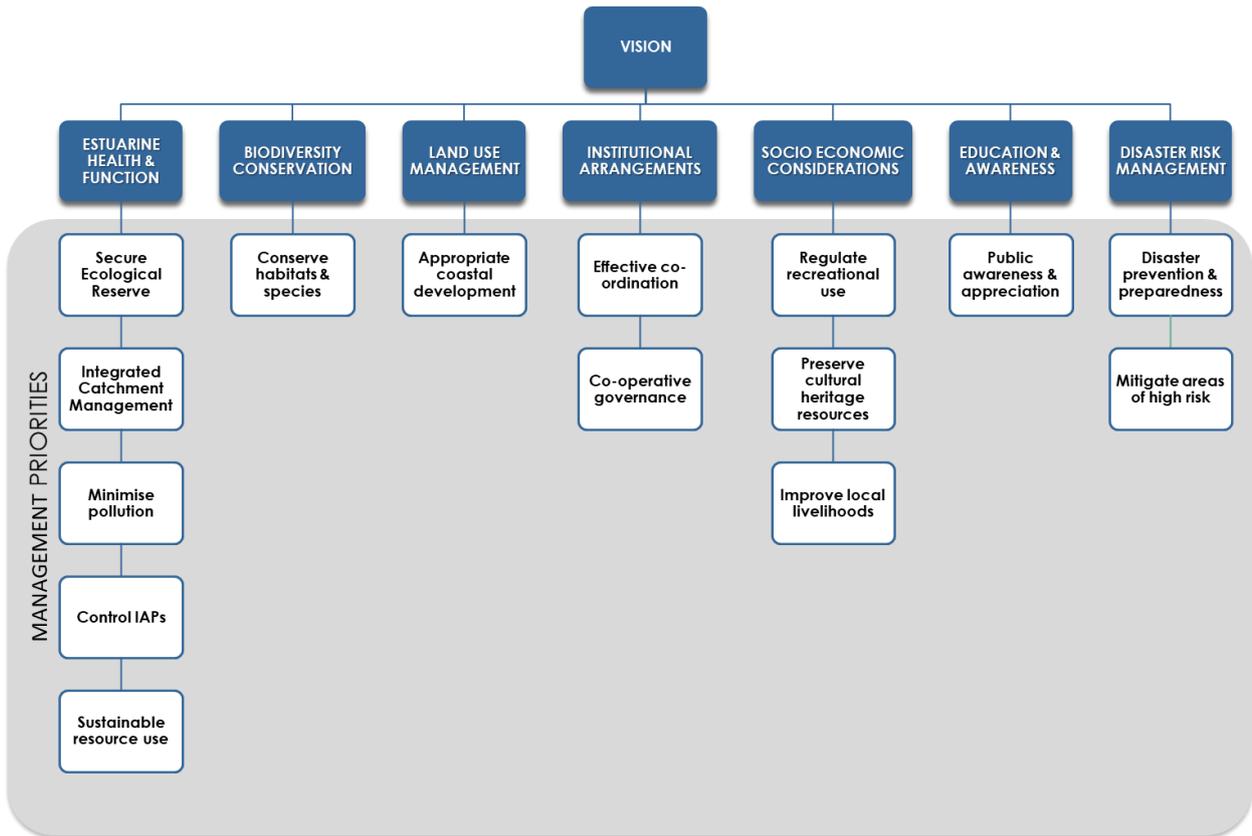
## 5 PRIORITY MANAGEMENT OBJECTIVES AND ASSOCIATED ACTIVITIES

After the review of the background information, as well as after conducting stakeholder engagement, a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the Gwaing River estuary under the current management practices was prepared.

**Table 3: SWOT Analysis**

<b>STRENGTHS</b> <i>(highlights, uniqueness?)</i>	<b>WEAKNESSES</b> <i>(what could you improve?)</i>
<ul style="list-style-type: none"> <li>• A key implementation priority of the Garden Route Coastal Management Programme is the prevention of contamination of marine and estuary waters</li> <li>• Falls within the Outeniqua Sensitive Coastal Areas, which provides a further level of protection against development</li> <li>• Estuary and undeveloped surrounds identified as Critical Biodiversity Area in Garden Route Biodiversity Sector Plan</li> <li>• Existing public amenity and facilities at the mouth</li> <li>• 'Strandloper' caves</li> <li>• Recreational and aesthetic value</li> </ul>	<ul style="list-style-type: none"> <li>• Information about the estuary is lacking / poor – limited scientific knowledge</li> <li>• Poor water quality due to nutrient loading</li> <li>• Prevalence of invasive alien plant species</li> <li>• Due to water quality issues, the system poses a potential health threat</li> <li>• Antisocial behaviour of visitors to the mouth</li> <li>• Access to the Western edge via private property</li> <li>• Poaching</li> </ul>
<b>OPPORTUNITIES</b> <i>(Opportunities for positive change)</i>	<b>THREATS</b> <i>(what could prevent the EMP from working?)</i>
<ul style="list-style-type: none"> <li>• Removal of alien invasive plants would benefit degraded wetlands in the system, which would provide some socio-economic benefit, as they are easily accessible</li> <li>• Capitalising on heritage resources</li> <li>• Capitalising on existing facilities once reinstated</li> <li>• Capitalising on unique rock formations at mouth</li> <li>• Potential for local by-in and custodianship</li> </ul>	<ul style="list-style-type: none"> <li>• The system is targeted for further water resource development</li> <li>• Further development in the catchment</li> <li>• Wastewater discharge from Wastewater Treatment Plant</li> <li>• High levels of alien invasive plants</li> <li>• Climate change and loss of aquatic ecosystem</li> <li>• Continued pressure to privatise access to the mouth</li> <li>• Possible overexploitation of marine living resources due to accessibility</li> <li>• Lack of capacity for compliance and enforcement</li> </ul>

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



**Figure 5: Summary of priority management objectives per management sector**

## 5.1 Estuarine Health and Function

**Strategic Objective 1:** The ecological health and natural functioning of the Gwaing River estuary is maintained and safeguarded, its negative ecological trajectory and catchment impacts reversed, living resources are sustainably managed and estuary nursery function protected

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

Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
<b>Management Objective 1.1: Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning</b>				
<b>a.</b> Lobby Department of Water and Sanitation (DWS) Minister to sign off the recommended freshwater reserves, ensuring that the minimum flow requirement (specifically baseflow) for the estuary is restored	National Water Act (NWA)	<ul style="list-style-type: none"> <li>• Meetings held; correspondence written</li> <li>• Recommended reserve(s) signed off</li> <li>• Baseflow is restored</li> <li>• B/C ecological condition maintained</li> </ul>	HIGH	Breede-Gouritz Catchment Management Agency (BGCMA), Responsible Management Authority (RMA)
<b>b.</b> Once classification study signed off, follow up on implementation of water resource classification process	NWA	<ul style="list-style-type: none"> <li>• Meetings held; correspondence written</li> <li>• Water resource classified</li> <li>• Baseflow is protected</li> </ul>	HIGH	BGCMA, RMA
<b>c.</b> Install flow gauging probe in the catchment above the estuary (if identified as priority estuary by Department of Environment, Forestry and Fisheries (DEFF) and DEA&DP.	NWA	<ul style="list-style-type: none"> <li>• Determination of the importance of the Gwaing estuary completed</li> <li>• Flow gauging probe installed</li> <li>• Ongoing monitoring and generation of data</li> </ul>	If Gwaing identified as a priority estuary	DWS, DEFF, BGCMA

<b>d.</b>	Monitor natural mouth dynamics (in partnership with neighbouring landowners and other Interested and Affected Parties (I&APs))	NWA (RDM)	<ul style="list-style-type: none"> <li>• Mouth state documented</li> <li>• Photographic database generated</li> </ul>	HIGH	RMA
<b>e.</b>	Investigate the need and desirability of artificial breaching as a means to alleviate poor water quality, should such conditions become more frequent	Integrated Coastal Management Act (ICMA), National Environmental Management Act (NEMA)	<ul style="list-style-type: none"> <li>• Feasibility study undertaken</li> <li>• Conditions/thresholds for artificial breaching determined</li> </ul>	MEDIUM	RMA
<b>f.</b>	Monitor and report on the status of the estuary annually (inclusive of estuarine stresses and impacts)	NWA	<ul style="list-style-type: none"> <li>• Estuary impacts identified</li> <li>• Mitigation measures established</li> <li>• Annual report submitted to DEFF and EAF</li> <li>• Data incorporated into EMP 5-year review</li> </ul>	MEDIUM	RMA (supported by e.g. CapeNature, Department of Science and technology (DST), Council for Scientific and Industrial Research (CSIR).
<b>g.</b>	Catchment water quantity and quality to be summarised and reported on	NWA	<ul style="list-style-type: none"> <li>• Annual report submitted to DEFF</li> </ul>	LOW	DWS, BGCMA, George LM
<b>h.</b>	Undertake seasonal (summer/winter) monitoring of fish and bird populations, taking RQOs into account	NWA (RDM), National Environmental Management: Biodiversity Act (NEM: BA), Marine Living Resources Act (MLRA)	<ul style="list-style-type: none"> <li>• Species list and abundance data produced</li> <li>• Databases developed</li> <li>• Monitoring reports compiled and submitted</li> <li>• Data incorporated into EMP 5-year review</li> </ul>	HIGH	RMA (supported by e.g. CapeNature, DST, CSIR)

i.	Undertake full Resource Directed Measures (RDM) monitoring every 3 years	ICMA, NWA	<ul style="list-style-type: none"> <li>• Required monitoring undertaken</li> <li>• Data produced and reported on</li> <li>• Data incorporated into EMP 5-year review</li> </ul>	LOW	DWS, BGCMA, RMA (funding from Water Research Commission (WRC), DST)
<b>Management Objective 1.2: Ensure estuary requirements are integrated into catchment processes to ensure healthy water quality</b>					
a.	EMP included in catchment management strategy, and catchment classification systems and processes	NWA	<ul style="list-style-type: none"> <li>• EMP integrated into Breede-Gouritz Catchment Management Strategy (BGCMS)</li> <li>• Estuary acknowledged as sensitive end-points</li> <li>• Catchment impacts identified and mitigation strategies investigated</li> </ul>	HIGH	BGCMA
b.	Catchment land use map developed and updated annually, to identify potential threats to the estuary	NWA, Conservation of Agricultural Resources Act (CARA)	<ul style="list-style-type: none"> <li>• Updated land use map produced every year</li> <li>• Potential sources of pollution identified</li> </ul>	HIGH	DEFF (Land Care)
c.	Land use and effluent management included in the Catchment Management Strategy (CMS)	NWA	<ul style="list-style-type: none"> <li>• CMS reduces nutrient pollution from agricultural practices and identifies additional sources of pollution (land use and effluent) to the estuary and provides mitigation strategies</li> </ul>	HIGH	BGCMA
d.	Water use plan updated on an annual basis	NWA	<ul style="list-style-type: none"> <li>• Updated water use plan produced every year</li> </ul>	HIGH	DWS (Resource protection)
e.	Municipal SDF and environmental overlay updated as and when required	Municipal Systems Act (MSA)	<ul style="list-style-type: none"> <li>• Updated SDF and overlays produced</li> </ul>	HIGH	George LM

**Management Objective 1.3: Minimise pollution by addressing activities that lead to poor water quality**

*Gwaing WWTW*

<b>a.</b>	Implement and document DEFF and DWS policy to not allow effluent discharge directly to the estuary (including WWTW, septic tanks, conservancy tanks, industrial & livestock effluent etc.)	NWA	<ul style="list-style-type: none"> <li>Discharge of effluent strictly prohibited</li> <li>Upstream discharges monitored</li> </ul>	HIGH	RMA, George LM
<b>b.</b>	Implement reduce, reuse, recycle and recover options for effluent	NWA	<ul style="list-style-type: none"> <li>Reduction in discharge volumes</li> <li>Improved Water Quality (WQ) in estuary</li> </ul>	HIGH	George LM
<b>c.</b>	Ensure estuary is included municipal wastewater management plan in Gwaing WWTW	NWA, National Environmental Management: Waste Act (NEM: WA), MSA	<ul style="list-style-type: none"> <li>Estuary recognised in management plan</li> <li>Specific measures/management guidelines in place to conserve downstream ecosystems</li> </ul>	HIGH	George LM
<b>d.</b>	Ensure Gwaing WWTW operating to design specifications, with mandatory maintenance, and frequent system and WQ monitoring	NWA, MSA	<ul style="list-style-type: none"> <li>Compliance reports submitted to RMA and EAF</li> <li>WWTW functioning within specifications</li> <li>Improved WQ of discharged effluent</li> </ul>	HIGH	DWS, George LM
<b>e.</b>	Ensure the development and implementation of an Incident Management Protocol for the Gwaing WWTW	NWA	<ul style="list-style-type: none"> <li>Incident Management Protocol</li> <li>Break downs, failures and spills timeously addressed</li> <li>Effective remediation</li> <li>Contingencies developed to prevent similar incidents</li> </ul>	HIGH	George LM

<i>Water Quality Monitoring</i>					
<b>f.</b>	Obtain the data emanating from WQ monitoring by local and regional authorities within feeder rivers and inlets	NWA	<ul style="list-style-type: none"> <li>Local and regional authorities engaged</li> <li>Data obtained and included in integrated WQ monitoring programme</li> </ul>	MEDIUM	RMA, George LM, DWS, BGCMA
<b>g.</b>	Undertake quarterly basic WQ monitoring within the estuary, taking Resource Quality Objectives (RQOs) into account (as part of broader WQ programme)	NWA	<ul style="list-style-type: none"> <li>Estuary WQ database maintained to facilitate long term database</li> <li>Annual report compiled and provided to EAF</li> <li>EMP informed by monitoring results going forward</li> </ul>	HIGH	George LM
<b>h.</b>	Develop an integrated and coordinated quality WQ monitoring programme that identifies possible threats and sources of pollution and health risk in the estuary (See Section 7.1.4)	NWA	<ul style="list-style-type: none"> <li>Pollution sources (in addition to agricultural run-off) identified</li> <li>Regular monitoring of strategic sites</li> <li>Mitigation measures implemented</li> <li>Communication protocol established and information disseminated</li> <li>Public warning system developed</li> </ul>	HIGH	George LM, DWS, BGCMA
<i>General</i>					
<b>i.</b>	Develop and implement contingency plans to address specific sources of pollution (sewage, oil spill, chemical spill etc.)	NWA, ICMA, NEMA	<ul style="list-style-type: none"> <li>Identify specific potential sources of pollution</li> <li>Contingency plans developed and approved</li> <li>Contingency plan to include a health incident evacuation plan, identifying actions, timing and responsible agencies and actors.</li> <li>Mitigation / clean-up undertaken</li> <li>Investigation initiated, and enforcement actions undertaken</li> </ul>	MEDIUM	RMA, George LM, BGCMA, DWS, DEFF

<b>j.</b>	Enforce best practice guidelines in sustainable urban drainage systems	MSA, ICMA	NWA,	<ul style="list-style-type: none"> <li>• 1-day training for officials convened and attended</li> <li>• Sustainable Urban Drainage Systems (SUDS) applied by building control and technical services</li> </ul>	MEDIUM	George LM
<b>k.</b>	Monitor urban drainage/stormwater systems	MSA, ICMA	NWA,	<ul style="list-style-type: none"> <li>• Patrols undertaken by appropriate municipal dept.</li> <li>• Blocked systems reported,</li> <li>• Inappropriate activities halted and reported</li> <li>• Mitigation / clean-up undertaken</li> <li>• Identify and prosecute offenders</li> </ul>	MEDIUM	George LM
<b>l.</b>	Enforce agricultural best practice, specifically to reduce nutrient enriched runoff and sediment erosion from surrounding farms and catchment	NWA, CARA		<ul style="list-style-type: none"> <li>• Engagement with farmers in catchment initiated</li> <li>• Best practice methods promoted and implemented</li> <li>• Improved water quality variables</li> </ul>	HIGH	DALRRD
<b>m.</b>	Implement waste management plan, with a focus on peak visitor periods	NEM: WA, MSA		<ul style="list-style-type: none"> <li>• Appropriate preparation for peak periods</li> <li>• Clean-up operations undertaken after peak visitor periods</li> </ul>	LOW	George LM, RMA, DEF: Working for the Coast (DEFF: WftC)
<b>Management Objective 1.4: Control the spread and densification of invasive alien plant species</b>						
<b>a.</b>	Identify and prioritise infested areas	CARA, NWA		<ul style="list-style-type: none"> <li>• Priority areas identified</li> <li>• Appropriate methods of control determined</li> </ul>	MEDIUM	RMA, DEF: Working for Water (DEFF: WfW)
<b>b.</b>	Develop and implement invasive alien species eradication programme	CARA, NWA		<ul style="list-style-type: none"> <li>• Invasive Alien Plants (IAPs) eradication programme implemented</li> <li>• Increased area of IAPs removed</li> </ul>	MEDIUM	RMA, DEFF: WfW

<b>Management Objective 1.5: Ensure sustainable resource use through an effective level of compliance management</b>					
<b>a.</b>	Determine status of fish and bait stocks in Gwaing River estuary, including regular monitoring to determine recruitment patterns	MLRA	<ul style="list-style-type: none"> <li>• Research undertaken</li> <li>• Data generated and results reported</li> <li>• Data incorporated into EMP 5-year review</li> </ul>	MEDIUM	DEFF (supported by e.g. CapeNature, DST, CSIR)
<b>b.</b>	Assess, regulate and quantify extractive resource use activities on the estuary through relevant monitoring programmes (e.g. roving creel surveys, compliance patrols)	MLRA	<ul style="list-style-type: none"> <li>• Monitoring programme developed and implemented</li> <li>• Monthly counts of number of harvesters</li> <li>• Ad hoc patrols conducted</li> </ul>	MEDIUM	DEFF
<b>c.</b>	Deploy human resources for ad hoc compliance and enforcement in respect to MLRA	MLRA	<ul style="list-style-type: none"> <li>• Improved fish and invertebrate populations</li> <li>• Creel survey undertaken</li> <li>• Research projects commissioned</li> <li>• Reports submitted to DEFF, RMA and Estuary Advisory Forum (EAF)</li> </ul>	LOW	CapeNature/DEFF
<b>d.</b>	Investigate the number of subsistence users and subsistence resource use and feasibility of establishing a permitting system	MLRA	<ul style="list-style-type: none"> <li>• Subsistence users identified and counted</li> <li>• Feasibility study undertaken</li> </ul>	LOW	DEFF
<b>e.</b>	Informative signage, indicating zonation and allowable activities, to be placed at strategic points for all users/visitors	ICMA,	<ul style="list-style-type: none"> <li>• Key public spaces/access points identified</li> <li>• Signage created and erected</li> </ul>	LOW	RMA
<b>f.</b>	Develop and implement an effective communication strategy for users	ICMA, MLRA	<ul style="list-style-type: none"> <li>• Strategy developed</li> <li>• Effective network established</li> <li>• Cell phone link set up</li> <li>• Peaks season patrols undertaken</li> <li>• Investigative surveys/ questionnaires undertaken</li> </ul>	LOW	RMA

## 5.2 Biodiversity Conservation

**Strategic Objective 2: The biodiversity of the Gwaing River estuary is conserved.**

**Table 5: Management Objectives and Actions for Biodiversity Conservation**

	Proposed Activity/Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
<b>Management Objective 2.1: Ensure the conservation of estuarine habitats and indigenous species</b>					
a.	Adopt, implement, demarcate and enforce spatial zonation plan	ICMA, Land Use Planning Act (LUPA)	<ul style="list-style-type: none"> <li>• EMP and spatial zonation included in municipal IDP/SDF</li> <li>• EFZ controls enforced and offenders prosecuted</li> <li>• No further permanent development in the EFZ (e.g. only new sacrificial infrastructure within EFZ permitted)</li> <li>• Reduced illegal activities</li> <li>• Reduced habitat loss/degradation and disturbance, and inappropriate behaviour</li> <li>• Improved fish and invertebrate populations</li> </ul>	MEDIUM	RMA, George LM, DEFF
b.	Incorporate Gwaing EMP into GRBR Management Plan (in accordance with the Western Cape Biodiversity Reserves Act (WC BRA))	ICMA, NEM: PAA, WC BRA	<ul style="list-style-type: none"> <li>• EMP and spatial zonation included in management plan for GRBR</li> </ul>	MEDIUM	RMA, CapeNature, GRBR
c.	Lobby GRBR to establish an estuarine division to ensure commitment to estuarine matters in the region	WC BRA	<ul style="list-style-type: none"> <li>• Estuarine division established, and estuarine co-ordinator appointed</li> </ul>	MEDIUM	RMA, GRBR, CapeNature
d.	Develop and publish estuarine bylaws or regulations to support spatial zonation	MSA, ICMA	<ul style="list-style-type: none"> <li>• Bylaws developed and gazetted</li> </ul>	MEDIUM	RMA, George LM

e.	Instate educational signage to promote conservation	WC BRA, National Environmental Management: Protected Areas Act (NEM: PAA), NEM: BA	<ul style="list-style-type: none"> <li>• Signage created and erected in key public spaces</li> </ul>	LOW	GRBR, CapeNature
f.	Engage with landowners and stakeholders to encourage environmental custodianship/ stewardship on adjacent properties.	NEMA (Duty of Care)	<ul style="list-style-type: none"> <li>• Meeting with adjacent landowners convened (river and estuarine)</li> <li>• Signed agreements with landowners</li> <li>• Degraded areas rehabilitated</li> <li>• Integrity of estuary improved and maintained</li> </ul>	MEDIUM	RMA, George LM,

### 5.3 Land-use and Infrastructure Planning and Development

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

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

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
<b>Management Objective 3.1: Ensure appropriate and sustainable coastal development in and around the Gwaing River estuary, considering ecosystem services and sense of place</b>					
a.	Incorporate Gwaing EMP into GRBR Management Plan	ICMA, NEM: PAA, WC BRA	<ul style="list-style-type: none"> <li>• EMP and spatial zonation included in management plan for GRBR</li> </ul>	HIGH	RMA, CapeNature, GRBR
b.	RMA to adopt and incorporate EMP and spatial zonation plan into all municipal and relevant government department planning documents and processes (e.g. municipal IDP, SDF, zoning scheme & overlay, Water Use Licence (WUL) Applications, Environmental Impact Assessment (EIA) Applications)	MSA, LUPA, NEMA, ICMA	<ul style="list-style-type: none"> <li>• EMP included in all relevant planning documents</li> <li>• EFZ respected as a no development area</li> </ul>	HIGH	George LM, All authorities
c.	Ensure that all proposed developments adhere to the full suite of relevant environmental legislation, specifically the coastal management line, coastal protection zone, and associated development controls	NEMA, LUPA, ICMA, etc	<ul style="list-style-type: none"> <li>• All developments comply with environmental legislation and environmental best practice / risk aversion approach</li> <li>• No permanent development, expansions, infilling or land transformation of EFZ</li> <li>• Transgressors prosecuted</li> <li>• Corrective action undertaken</li> </ul>	HIGH	DEA&DP, George LM

			<ul style="list-style-type: none"> <li>• Reduced risk of degradation, transformation and disturbance to the estuary</li> </ul>		
<b>d.</b>	Use EAF as source of I&APs for Impact Assessments	MSA, LUPA, ICMA, NEMA	<ul style="list-style-type: none"> <li>• EAF partakes in development planning affecting the estuary</li> <li>• Impacts on the estuary are mitigated/prevented</li> </ul>	MEDIUM	RMA, George LM, Garden Route DM, DEA&DP

## 5.4 Institutional and Management Structures

**Strategic Objective 4:** The Gwaing River estuary is well managed through effective co-operative governance.

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

Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
<b>Management Objective 4.1: Ensure effective co-ordination of estuarine management responsibilities</b>				
a. Ensure incorporation of Gwaing EMP into GRBR Management Plan to facilitate implementation of EMP	ICMA, NEM: PAA, WC BRA	<ul style="list-style-type: none"> <li>EMP included in management plans for the Garden Route Area</li> </ul>	HIGH	RMA, GRBR
b. RMA adopts and incorporates the EMP and the spatial zonation plan into planning documents	MSA, LUPA, NEMA, ICMA	<ul style="list-style-type: none"> <li>EMP and zonation plan adopted by RMA</li> <li>EMP included in all relevant planning documents</li> </ul>	HIGH	RMA
c. Develop and publish estuarine bylaws or regulations to support spatial zonation	MSA, ICMA	<ul style="list-style-type: none"> <li>Bylaws developed and gazetted</li> </ul>	MEDIUM	George LM
d. Undertake needs analysis and identify skills required	ICMA	<ul style="list-style-type: none"> <li>Needs and shortages identified</li> <li>Motivation for acquisition drafted and approved</li> <li>Equipment purchased and maintained</li> </ul>	HIGH	RMA
e. Implement skills development, ongoing training or co-opt additional members / secondment for estuarine management to ensure capacity	ICMA	<ul style="list-style-type: none"> <li>Motivation for training drafted and approved</li> <li>Staff attend relevant accredited training courses</li> <li>Memorandum of Understanding (MOU) to be developed for secondments</li> </ul>	HIGH	RMA

<b>f.</b>	Develop good communication protocols and processes with implementing agents (The RMA to develop working relationships with mandated department & agreements need to be developed to address each management action)	ICMA	<ul style="list-style-type: none"> <li>• Project champions identified</li> <li>• Networks established and contacts database compiled</li> <li>• Regular email correspondence</li> </ul>	HIGH	RMA
<b>g.</b>	Ensure that EMP is maintained, enforced and budgeted for annually	ICMA, MSA, LUPA, NWA	<ul style="list-style-type: none"> <li>• An action plan for securing future funding drafted and approved</li> <li>• Funding secured for 5-year cycle</li> </ul>	HIGH	All authorities
<b>h.</b>	Constitute and maintain a fully functional, regional EAF (or utilise other applicable forum) to facilitate co-operative governance	ICMA, MSA, LUPA, NWA	<ul style="list-style-type: none"> <li>• EAF constituted (Membership includes representatives of government and stakeholders/civil society)</li> <li>• Regional EAF meets on a quarterly basis</li> <li>• Meetings are minuted</li> </ul>	HIGH	RMA
<b>i.</b>	RMA present on critical forums to ensure that estuarine issues are tabled, e.g. Catchment management Agency (CMA), Water Users Associations (WUA), Agriculture groups etc.	ICMA	<ul style="list-style-type: none"> <li>• RMA attendance at critical forum meetings</li> <li>• Meetings are minuted</li> </ul>	HIGH	RMA
<b>j.</b>	Monitor, review and report on the progress of EMP actions and achievements on annual basis	ICMA	<ul style="list-style-type: none"> <li>• Feedback received from participating agencies</li> <li>• Annual reporting to DEFF and EAF</li> <li>• Action plans updated as and when required</li> </ul>	MEDIUM	RMA
<b>k.</b>	Undertake formal 5-year review as prescribed by the NEMP, with involvement of EAF	ICMA	<ul style="list-style-type: none"> <li>• Motivation for updated drafted and approved</li> <li>• Funding confirmed</li> <li>• Terms of reference drafted</li> <li>• Consultants appointed</li> <li>• Plan updated</li> </ul>	LOW	RMA

l.	Provincial authority to intervene if RMA incapacitated and ineffectual	ICMA	<ul style="list-style-type: none"> <li>Needs and shortages identified</li> <li>Motivation for hand over</li> <li>Meeting with EAF</li> <li>MOU signed</li> </ul>		DEA&DP
<b>Management Objective 4.2: Define co-operative governance arrangements</b>					
a.	Identify and implement procedures to ensure cooperative governance between all gov. depts. with a mandate to act	ICMA, Inter-governmental relations Act (Act 13 of 2005)	<ul style="list-style-type: none"> <li>Roles and responsibilities defined and accepted via MOUs signed between RMA and spheres of government and participating agencies</li> <li>Regional EAF meets on a quarterly basis</li> <li>Meetings are minuted</li> <li>Active collaboration of various implementing agents</li> </ul>	HIGH	All authorities
b.	EAF to monitor performance of RMA in respect to implementation of plan	ICMA	<ul style="list-style-type: none"> <li>Authorities to provide formal feedback on mandated activities</li> <li>Regional EAF meets on a quarterly basis</li> </ul>	MEDIUM	All authorities, All stake-holders
c.	Individual agencies to identify and address training needs, with possible secondment to address training and capacity shortfalls	ICMA	<ul style="list-style-type: none"> <li>Motivation for training drafted and approved</li> <li>Staff attend relevant accredited training courses</li> <li>MOU to be developed for secondments</li> </ul>	MEDIUM	All authorities
d.	Individual agencies to allocate resources, create and fill posts (including project champions), and acquire necessary infrastructure, resources and equipment of fulfil their mandates	MSA, NWA, ICMA, NEMA, WC BRA	<ul style="list-style-type: none"> <li>Need and Desirability investigation undertaken</li> <li>Motivation for acquisition drafted and approved</li> <li>Equipment purchased and maintained</li> </ul>	MEDIUM	All authorities

			<ul style="list-style-type: none"> <li>• Project champion(s) for allocated management actions</li> <li>• Staff appraisals in terms of management actions and projects (performance management system implemented)</li> </ul>		
e.	Mandated authorities and participating agencies to confirm budget allocations for mandated activities/actions	MSA, NWA, ICMA, NEMA, WC BRA	<ul style="list-style-type: none"> <li>• Formal feedback from authorities on mandated activities</li> <li>• Motivation for budget drafted and approved</li> <li>• Funding secured for 5-year cycle</li> </ul>	MEDIUM	All authorities

## 5.5 Socio-economic Considerations

**Strategic Objective 5: Socio-economic benefits are enhanced and regulated to ensure sustainable use of the Gwaing River estuary and its resources.**

**Table 8: Management Objectives and Actions for Socio-economic Considerations**

Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
<b>Management Objective 5.1: Regulate recreational use of the estuary</b>				
a. Adopt, demarcate and enforce spatial zonation plan to protect estuarine habitats and other users	ICMA, WC BRA	<ul style="list-style-type: none"> <li>• EFZ controls enforced and offenders prosecuted</li> <li>• Reduced habitat loss/degradation and disturbance, and inappropriate behaviour</li> </ul>	MEDIUM	RMA, GRBR, CapeNature
b. Informative signage, indicating zonation and allowable activities, to be placed at strategic points	ICMA, WC BRA	<ul style="list-style-type: none"> <li>• Signage created and erected in key public spaces</li> </ul>	MEDIUM	RMA, GRBR
c. Determine carrying capacities for each water-based activity in consultation with relevant organs of state	WC EMFIS Jetskis and Motorised Watercraft	<ul style="list-style-type: none"> <li>• Carrying capacities determined</li> <li>• Review (and amendment if necessary) of boating bylaws</li> <li>• Notification gazetted</li> </ul>	MEDIUM	RMA, George LM
d. Develop clear regulations to manage each use and monitor users and impacts	Guideline 2019	<ul style="list-style-type: none"> <li>• Regulations developed and gazetted</li> <li>• Regulations enforced</li> <li>• Counts of users recorded</li> <li>• Impacts recorded</li> </ul>	MEDIUM	RMA, George LM
e. Improve safety of swimming area by formalising agreements surrounding the lifeguard duties and facilities, including providing the necessary safety equipment	MSA, ICMA	<ul style="list-style-type: none"> <li>• Agreement formalised</li> <li>• Formal appointment of lifeguards</li> <li>• Employment opportunities</li> <li>• Safety equipment in place</li> <li>• Number of incidents</li> </ul>	MEDIUM	RMA, George LM, Garden Route DM

f.	Legalise the slipway as a Public Launch Site and develop and implement a management plan	ICMA, Public launch Site (PLS) Regulations	<ul style="list-style-type: none"> <li>• Slipway registered as a Public Launch site</li> <li>• Management Plan developed</li> <li>• Number of boats launching</li> </ul>	MEDIUM	CapeNature, George LM
g.	Continue to monitor and regulate boat usage, including number of boats operating on the estuary or taking part in a specific activity (e.g. marine charter, canoeing).		<ul style="list-style-type: none"> <li>• Counts of boats on the water recorded</li> <li>• Counts of boat licenses/users/ participants recorded</li> <li>• Carrying capacity enforced</li> <li>• Boat usage regulated</li> <li>• Reduced habitat loss/degradation and disturbance, and inappropriate behaviour</li> <li>• Annual report submitted to RMA and EAF</li> </ul>	MEDIUM	RMA, CapeNature
<b>Management Objective 5.2: Preserve and manage all cultural heritage resources</b>					
a.	Identify and map tangible cultural heritage resources	NHRA	<ul style="list-style-type: none"> <li>• Information gathered, and inventory developed</li> <li>• Heritage assets mapped</li> <li>• Access routes rehabilitated and formalised</li> <li>• Cultural Heritage Plan developed and implemented</li> <li>• Site-specific management guidelines and maintenance plans developed for all sites</li> <li>• Heritage sites managed by an appointed custodian</li> <li>• Appropriate partnerships / agreements established</li> </ul>	HIGH	RMA, George LM, SAHRA
b.	Determine access needs and rehabilitation requirements (if necessary)	NHRA		HIGH	RMA, George LM
c.	Develop and implement a Cultural Heritage Management Programme with site specific guidelines, and maintenance plan(s)	NHRA		HIGH	RMA, George LM
d.	Appoint a custodian of the cultural heritage sites	NHRA		HIGH	RMA, George LM, SAHRA

**Management Objective 5.3: Improve local livelihoods by promoting the involvement of historically disadvantaged communities and individuals in the provision of tourism & recreation services**

<b>a.</b>	Investigate livelihood opportunities, promoting previously disadvantaged communities (e.g. tour guides to the caves, maintenance staff, management of the ablutions and public boat launch site)	ICMA, NHRA, MSA	<ul style="list-style-type: none"> <li>• Livelihood study completed and target communities identified</li> <li>• Opportunities identified, and viable options implemented – projects initiated</li> <li>• Initiatives compliant with all forms of legislation and planning frameworks</li> <li>• Training of personnel</li> </ul>	MEDIUM	RMA, George LM
<b>b.</b>	Environmental Protection and Infrastructure Programmes (EPIP) such as WfW and DEFF: WftC	ICMA	<ul style="list-style-type: none"> <li>• EPIP programmes adopted and implemented</li> <li>• Signed agreements</li> <li>• Increased employment opportunities</li> </ul>	MEDIUM	RMA, George LM

## 5.6 Education & Awareness

**Strategic Objective 6: Members of society are sensitive to and aware of the value and importance of the Gwaing River estuary.**

**Table 9: Management Objectives Actions for Education & Awareness**

Action	Relevant Legislation	Performance Indicator	Priority	Responsibility	
<b>Management Objective 6.1: Promote high levels of public awareness and appreciation of the value of estuaries</b>					
a.	Develop and effective education and awareness programme for local farmers, residents and visitors	ICMA	<ul style="list-style-type: none"> <li>Education &amp; awareness programme developed and implemented at schools and through interest groups</li> <li>Increased educational opportunities at group gatherings, community meetings, conferences etc.</li> </ul>	MEDIUM	RMA, GRBR BGCMA,
b.	Source and/or commission educational and informative material including signage, posters, pamphlets and webpage design	ICMA	<ul style="list-style-type: none"> <li>Signage created and erected Posters and pamphlets erected/ disseminated</li> <li>George estuaries webpage operational</li> </ul>	MEDIUM	RMA, GRBR, CapeNature, George LM
c.	Engage and educate estuary users (including subsistence and recreational users)	ICMA	<ul style="list-style-type: none"> <li>Reduction in illegal activities</li> <li>Reduced habitat loss/degradation and disturbance, and inappropriate behaviour</li> <li>Informative surveys/talks undertaken</li> </ul>	LOW	RMA, CapeNature, George LM

## 5.7 Disaster Risk Management

**Strategic Objective 7: Potential risks that could impact the Gwaing River estuary are reduced (inclusive of climate change impacts).**

**Table 10: Management Objectives and Actions for Disaster Risk Management**

Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
<b>Management Objective 7.1: Disaster prevention and preparedness</b>				
a. Conduct and maintain a risk assessment portfolio and identify areas and infrastructure of potential concern (catchment/marine pollution, flooding, erosion, etc.)	Disaster Management Act (DMA) (Act 57 of 2002), NEM: Waste Act (Act 59 of 2008), NEMA, ICMA, NWA,	<ul style="list-style-type: none"> <li>Risk assessment portfolio compiled</li> <li>High risk areas identified and included in relevant plans</li> </ul>	MEDIUM	RMA, George LM
b. Establish a health incident evacuation plan, identifying actions, timing and responsible agencies and actors		<ul style="list-style-type: none"> <li>Health incident evacuation plan developed</li> <li>Emergency response networks established</li> </ul>	MEDIUM	RMA, George LM, DWS, BGCMA
c. Develop an integrated flood disaster management plan (flooding, marine storm surge), including estuary early warning and monitoring system, and evacuation protocols, etc.		<ul style="list-style-type: none"> <li>Integrated flood disaster management plan developed</li> <li>Estuary risks and early warning system compiled</li> <li>Emergency response networks established</li> </ul>	MEDIUM	RMA, George LM, BGCMA
<b>Management Objective 7.2: Mitigate areas of high risk</b>				
a. Identify, estimate costs, prioritise and rehabilitate areas of bank erosion, trampling, disturbed riparian vegetation (priority areas and hot spots).	ICMA, NEMA	<ul style="list-style-type: none"> <li>Degradation profiles compiled</li> <li>Rehabilitation programme developed &amp; implemented</li> <li>Re-establishment of indigenous vegetation</li> <li>Priority degraded areas restored</li> </ul>	MEDIUM	George LM

<b>b.</b>	Identify areas and infrastructure at risk of flooding and erosion, and develop contingency plans	DMA	<ul style="list-style-type: none"> <li>• High risk areas identified</li> <li>• Risk areas included in regional disaster management plan</li> <li>• Relevant plans updated with early warning and monitoring systems and evacuation protocols, and contingency plans for high erosion and flood risk areas.</li> </ul>	HIGH	RMA, George LM
<b>c.</b>	Install appropriate flooding and erosion defence for critical infrastructure	ICMA, NEMA,	<ul style="list-style-type: none"> <li>• Appropriate defence methods identified</li> <li>• Infrastructure protected</li> </ul>	LOW	George LM
<b>d.</b>	Enforce the 'Polluter pays' principle and timeous and appropriate rehabilitation/clean-up operations for damaged/polluted areas	NEMA, NWA	<ul style="list-style-type: none"> <li>• Transgressors prosecuted</li> <li>• Corrective action undertaken; degraded areas rehabilitated</li> </ul>	MEDIUM	George LM, DEA&DP

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## 6 PROPOSED SPATIAL ZONATION

### 6.1 Introduction

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

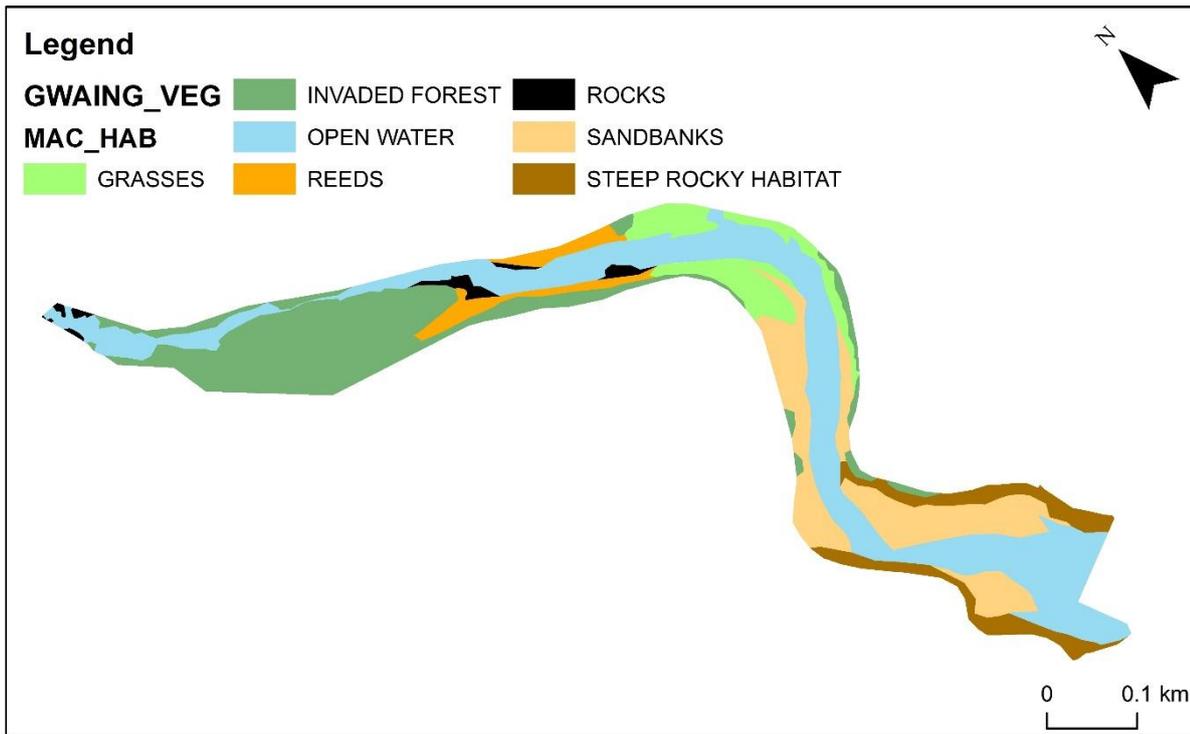
- The geographical boundary of the estuary also indicating important habitats (e.g. floodplain, open water, reed beds, sandflats, etc.);
- The surrounding land uses and existing infrastructure;
- Areas designated for the conservation and protection of biodiversity;
- Appropriate buffers in which land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

### 6.2 Habitat zones

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

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

The habitat map shown in Figure 6 is used as the baseline for the identification of sensitive estuarine habitats. Given the limited, low intensity use of the estuary (predominantly at the mouth), it is suggested that the entire estuary be managed as a single zonation type, where limited disturbance and harvesting of the marine living resources is permitted.



**Figure 6: Habitats identified in the Gwaing River estuary**

## 6.3 Legislated Coastal Boundaries and Buffer Zones

### 6.3.1 Estuarine Functional Zone

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

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

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

However, the 2018 National Biodiversity Assessment provides a more detailed definition of an estuary, that is: “a partially enclosed permanent water body, either continuously or periodically open to the sea on decadal time scales, extending as far as the upper limit of tidal action, salinity penetration or back-flooding under closed mouth conditions. During floods an estuary can become a river mouth with no seawater entering the formerly estuarine area or, when there is little or no fluvial input, an estuary can be isolated from the sea by a sandbar and become fresh or even hypersaline” (SANBI 2019).

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

### 6.3.2 Coastal Protection Zone and proposed Coastal Management Line

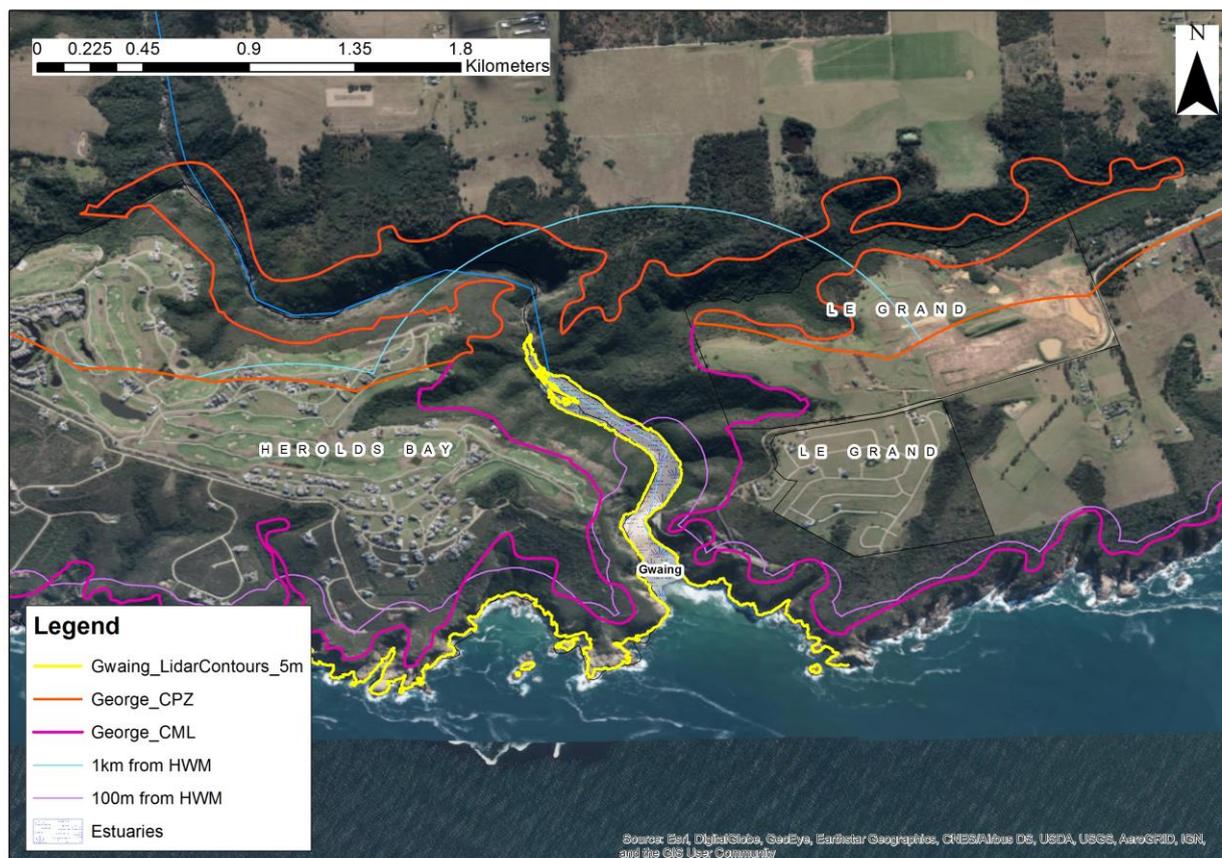
The Integrated Coastal Management (ICM) Act defines a default **Coastal Protection Zone (CPZ)** which, in essence, consists of a continuous strip of land, starting from the High Water Mark (HWM) and extending 100 m inland in developed urban areas zoned as residential, commercial, or public open space,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

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

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

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

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



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

### 6.3.3 Environmental Impact Assessment regulatory line

In respect of the EIA regulatory scheme, an additional line called the Development Set-Back Line (DSL) needs to be differentiated as it relates to the 'development set-back' referred to in the EIA regulations<sup>3</sup> rather than the coastal management lines described in the ICM Act. However, as part of the on-going process of defining coastal management lines for the Western Cape, it is currently **proposed that the CML, as defined under ICMA, also be used as the DSL.**

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

<sup>3</sup> The Environmental Impact Assessment Regulations, 2014 (as amended in 2017), published under Government Notice No. 326 in Gazette No. 40772 of 4 April 2017, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)

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

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

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

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

## 6.4 Zonation of Activities

### 6.4.1 Current zonations and uses

The table below lists the surrounding land use types as per the George Municipal Town Planning Scheme (TPS) (Figure 8) and activities occurring in and/or adjacent to the Gwaing River estuary (Table 11).



Figure 8: Extracts from the George Municipal Town Planning Scheme

**Table 11: Current zonations and activities occurring in and/or adjacent to the Gwaing River estuary**

LAND USE	DESCRIPTION
<p><b>Agriculture Zone 1: Agriculture</b></p>	<p>The objective of this zone is to promote and protect agriculture on farms as an important economic, environmental and cultural resource. Limited provision is made for non-agricultural uses to provide rural communities in more remote areas with the opportunity to increase the economic potential of their properties, provided these uses do not present a significant negative impact on the primary agricultural resource.</p> <p>Consent uses include an abattoir, additional dwelling units, and airfield, an animal care centre, aqua-culture, camping sites, farm grave yards; a farm shop; freestanding base telecommunication station, a function venue, guest house, helicopter landing pad, off-road trail, plant nursery, quarry, renewable energy structure, shooting range, tourist facilities and utility service.</p>
<p><b>Open Space Zone II (private open space)</b></p>	<p>The objective of this zone is to provide for private active and passive recreational areas, in order to promote recreation and enhance the aesthetic appearance of an area.</p> <p>Consent uses include a cemetery, environmental facilities; informal trading, a plant nursery, a restaurant, sports and recreation centre, tourist facilities, urban agriculture and utility service.</p>
<p><b>Open Space Zone III (Nature conservation area)</b></p>	<p>The objective of this zone is to provide for the conservation of natural resources in areas that have not been proclaimed as nature areas (non-statutory conservation), in order to sustain flora and fauna and protect areas of undeveloped landscape including woodlands, ridges, wetlands and the coastline. A range of consent uses is provided to supplement and support the main objective of this zone.</p> <p>Consent uses include a guest house, environmental facilities, freestanding base telecommunication station, harvesting of natural resources, a rooftop base telecommunication station, tourist accommodation, tourist facilities and utility service.</p>
<p><b>Resort Zone (area with no zoning on figure 8)</b></p>	<p>The objective of this zone is to promote tourist and holiday facilities in areas with special environmental or recreational attributes, and to encourage general public access to these facilities. At the same time, care should be exercised to minimise potential negative impacts of development on fragile environments. The guiding principle should be that a resort must not detract from the amenity that attracted the holiday facilities in the first place, nor should it cause a public nuisance for other people living and working in the vicinity. This zone should only be used in exceptional cases and is normally applicable to tourist developments outside established, built-up areas.</p>

	Primary use is for tourist accommodation and consent uses include freestanding base telecommunication station, function venue, hotel, off-road trail, rooftop base telecommunication station, tourist facilities and wellness centre.
<b>Garden Route Biosphere Reserve: Terrestrial Buffer Zone</b>	The Gwaing River and the estuary are classified as a Terrestrial Buffer Zone corridor between the Transitional highlands of Herold's Bay and the greater George area. As a buffer zone, this area is to be used for cooperative activities compatible with sound ecological practices, including environmental education, recreation, ecotourism, and applied and basic research (UNESCO, 2018)
<b>ACTIVITIES</b>	<b>DESCRIPTION</b>
<b>Fishing</b>	Limited subsistence and recreational fishing
<b>Bait harvesting</b>	Assumed limited sand prawn pumping
<b>Swimming</b>	Designated swimming beach at the mouth, with parking lot, and ablution facilities
<b>Boating (motorised)</b>	There is a public boat launch site (slipway into the sea at the estuary mouth). This is used for launching of marine chartered boats (i.e. access to the sea). Boating in the estuary is limited.

## 6.4.2 Proposed spatial zonation

### 6.4.2.1 Nature Access Zone

A single zonation type is proposed for the Gwaing River estuary, a Quiet/Nature Access Zone. As a Quiet Zone, limited activities are encouraged in the EFZ, which are fortunately governed by the remote location and relatively small size of the system, and these activities are directed toward accessing and appreciating nature. The objectives of this zone are as follows:

- To manage and direct visitor use, and plan infrastructure to minimise impact on sensitive environments;
- To actively manage users and visitor impacts; and
- Allows for minimal or more intensive biodiversity management intervention.

Allowable activities in this zone are to be managed as per Table 12 below. This zonation continues to allow for recreational activities at the mouth including swimming and walking. Special management is required for the recreational facilities on the eastern embankment and cultural heritage sites/caves on the western cliff faces.

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

**Table 12: Proposed zonation prescriptions for the Gwaing River estuary**

CONDITIONS OF USE	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY	ENFORCEMENT
QUIET / NATURE ACCESS* <ul style="list-style-type: none"> <li>Guided or unguided nature observation.</li> <li>Day hiking trails and/or short trails.</li> <li>Bird hides, canoeing, mountain biking &amp; rock-climbing where appropriate.</li> <li>Swimming at cove beach/mouth</li> <li>Vehicle access on designated routes, with controlled pedestrian access from parking areas or adjacent development zones using designated paths.</li> <li>No off-road vehicle access</li> <li>On water - only non-motorised vessels permitted in estuary (e.g. canoeing)</li> <li>No development within the EFZ</li> <li>No accommodation, camping or fires</li> <li>No clearing of indigenous vegetation for access or views</li> <li>Pedestrian access bridge to be maintained</li> </ul>	LUPA, Municipal TPS, Bylaws,	George LM	George LM
<ul style="list-style-type: none"> <li>Launching of motorised boats to sea only, subject to the possession of valid documentation</li> <li>Use of motorised boats in estuary strictly prohibited</li> </ul>	Merchant Shipping Act and regulations	South African Maritime Safety Association (SAMSA)	George LM / CapeNature
<ul style="list-style-type: none"> <li>No ad hoc construction of jetties and slip ways</li> </ul>	Seashore Act	CapeNature	CapeNature
<ul style="list-style-type: none"> <li>Fishing/ harvesting subject to the possession of an appropriate permit.</li> </ul>	MLRA Regulations	DEFF	DEFF/ CapeNature

\*Based on CapeNature protected area zonation scheme

### 6.4.3 Areas requiring rehabilitation

Little intervention is required along the Gwaing River estuary in terms of rehabilitation, apart from intensive invasive alien vegetation removal from the estuary and its catchment. The status of informal access to the various caves on the western shore is unknown and needs to be investigated in respect to rehabilitation to prevent undue environmental degradation.

Significant interventions are required in the catchment in terms of remediating poor water quality emanating from the Gwaing WWTW, agricultural and golf-course (irrigated) return flows.

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## 7 INTEGRATED MONITORING PLAN

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

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

### 7.1 Resource Monitoring

#### 7.1.1 Current Resource Monitoring

**Water chemistry:** A basic water quality monitoring programme funded by the Breede-Gouritz Catchment Management Agency is currently in place for the Gwaing River above the estuary and all water quality data collected is submitted to the Garden Route District. It is strongly recommended that this monitoring programme is maintained, and the data stored and utilised to inform the future management of the Gwaing River estuary.

There are no known ecological monitoring or research programmes (e.g. fish or birds, etc.) currently being undertaken for the Gwaing River estuary.

#### 7.1.2 Recommended Resource Monitoring Programmes

In the context of the Gwaing River estuary, general baseline information is lacking. The recommended baseline monitoring requirements to improve the confidence of the preliminary reserve determination as developed through Gouritz Water Classification Study (DWS, 2015), are provided Table 14 in Appendix 1. The recommended long-term monitoring requirements to ascertain impacts of changes in freshwater flow, and current and future impacts on the estuary and/or any improvement or reductions therein are listed in Table 15. The purpose of the recommended long-term monitoring programme is also to test for compliance with Ecological Specifications (Ecospecs) and Thresholds of potential concern (TPCs) and to continuously improve understanding of ecosystem function.

#### 7.1.3 Resource Quality Objectives / Ecological Specifications

Resource Quality Objectives (RQOs) or Ecological Specifications (EcoSpecs) are clear and measurable specifications of ecological attributes (in the case of estuaries - hydrodynamics, sediment dynamics, water quality and different biotic components) that define a specific ecological category, in this case a Category B/C.

Thresholds of potential concern (TPC) are defined as measurable end points related to specific abiotic or biotic indicators that if reached (or when modelling predicts that such points will be reached) prompts management action. In essence, TPCs should provide early

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warning signals of potential non-compliance to ecological specification (i.e. not the point of 'no return'). The EcoSpecs, and the TPCs for the Gwaing River estuary, for a Category B/C are presented in Table 16 (Appendix 2) (DWS, 2015; 2018).

#### **7.1.4 Recommended Pollution Monitoring Programme**

Poor water quality emanating from the catchment has been identified as major issue requiring attention, not only for the ecology of the estuarine environment, but also in terms of health risk for the public that utilise the mouth as a bathing area.

The Gwaing WWTW is located approximately 9 km upstream of the estuary and is thus not discharging directly to the system. However, it has the potential to significantly impact the water quality of the Gwaing River estuary.

In order to address possible threats and sources of pollution and health risk in the estuary, an integrated and coordinated water quality monitoring programme must be developed and implemented.

The following aspects must be included:

- 'End of pipe' water quality parameters in line with the permitted/authorised discharge standards;
- Riverine water quality parameters in line with the South African Water Quality Guidelines for Aquatic Ecosystems (DWAF, 1996), in conjunction with ecological biomonitoring, such as SASS5 (South African Scoring System v.5) below the discharge point and above the head of the estuary;
- Estuarine water quality parameters in line with the South African Water Quality Guidelines for Coastal Marine Waters: Natural Environment (DWAF, 1995) and Recreational Use (DEA, 2012); and
- Inclusion of catchment water quality monitoring by the Breede-Gouritz Catchment Management Agency.

## **7.2 Compliance Monitoring**

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

### **7.2.1 Current Compliance Monitoring**

Currently there is no known compliance monitoring taking place on the Gwaing River estuary, presumably due the remoteness of the estuary. Stakeholder feedback suggests the possibility of ad hoc patrolling by CapeNature, but this is yet to be confirmed (R. Loubser,

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*pers. comm.*<sup>4</sup>). The management status and monitoring of the boat launch site is also unknown.

It was also reported at the stakeholder meeting<sup>5</sup>, that water quality monitoring was undertaken infrequently at the George Wastewater Treatment Works.

In respect to water abstraction in the catchment, the number of registered water users and the volume of water being abstracted is being monitored by DWS in accordance with the respective water use permits/licenses and the ecological reserve determination, under the National Water Act. It is imperative that this form of monitoring continues to ensure sustained freshwater flow reaching the estuary.

### **7.2.2 Recommended Compliance Monitoring**

In respect to the implementation of this EMP, compliance monitoring will be the responsibility of the DEFF (or devolved to CapeNature), in terms of the marine living resources, and George LM, and will be undertaken according to legislation (MLRA) and policies applicable and by means of law enforcement and compliance monitoring protocols.

It is recommended that a scheduled compliance/law enforcement programme be developed, beginning with frequent patrols to ascertain degree and timing of estuary use (e.g. holiday periods), and then modified based on the findings (Table 13).

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<sup>4</sup> Mr. Coenraad Loubser, George Municipality, 25/02/2019

<sup>5</sup> Minutes of the stakeholder meeting for the Maalgate, Gwaing and Kaaimans estuaries, 28 August 2018, Conville Community Centre, Conville, George.

**Table 13: Recommended compliance monitoring requirements**

USE/ ACTIVITY	INDICATOR	FREQUENCY	TARGET/LIMIT	LEGISLATION	RESPONSIBILITY
<b>FISHING (including marine landings)</b>	<ul style="list-style-type: none"> <li>• Number of fishers;</li> <li>• Number of harvesters;</li> <li>• Species targeted</li> <li>• Catch volume;</li> <li>• Gear utilised</li> <li>• Number of offences/ transgressions</li> </ul>	Monthly, increased to weekly during peak season	Target species and limits as per MLRA regulations	MLRA	DEFF / CapeNature
<b>BOATING</b>	<ul style="list-style-type: none"> <li>• Number of boats and other vessels;</li> <li>• Main locations of boating</li> <li>• Number of boat licenses</li> <li>• Number of skipper licenses;</li> <li>• Adherence to boating by-laws</li> <li>• Number of offences/ transgressions</li> </ul>	Monthly, increased to weekly during peak season	Carrying capacity to be determined	Merchant Shipping Act (Act 51 of 1957)  Small Vessel Safety) Regulations	SAMSA

### 7.3 Performance Monitoring (Review & Evaluation)

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

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

- The effectiveness of the EMP and success with meeting the objectives (i.e. the performance monitoring plan);

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- Environmental changes at a local or a wider scale that could affect the estuarine resources or the implementation of the EMP; and
  - Changes (if any) to legislation, land-use planning, goals or policies that may require the EMP to be amended.

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

Table 17 in Appendix 3 provides the performance monitoring plan relative to the proposed management priorities.

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## 8 INSTITUTIONAL CAPACITY & ARRANGEMENTS

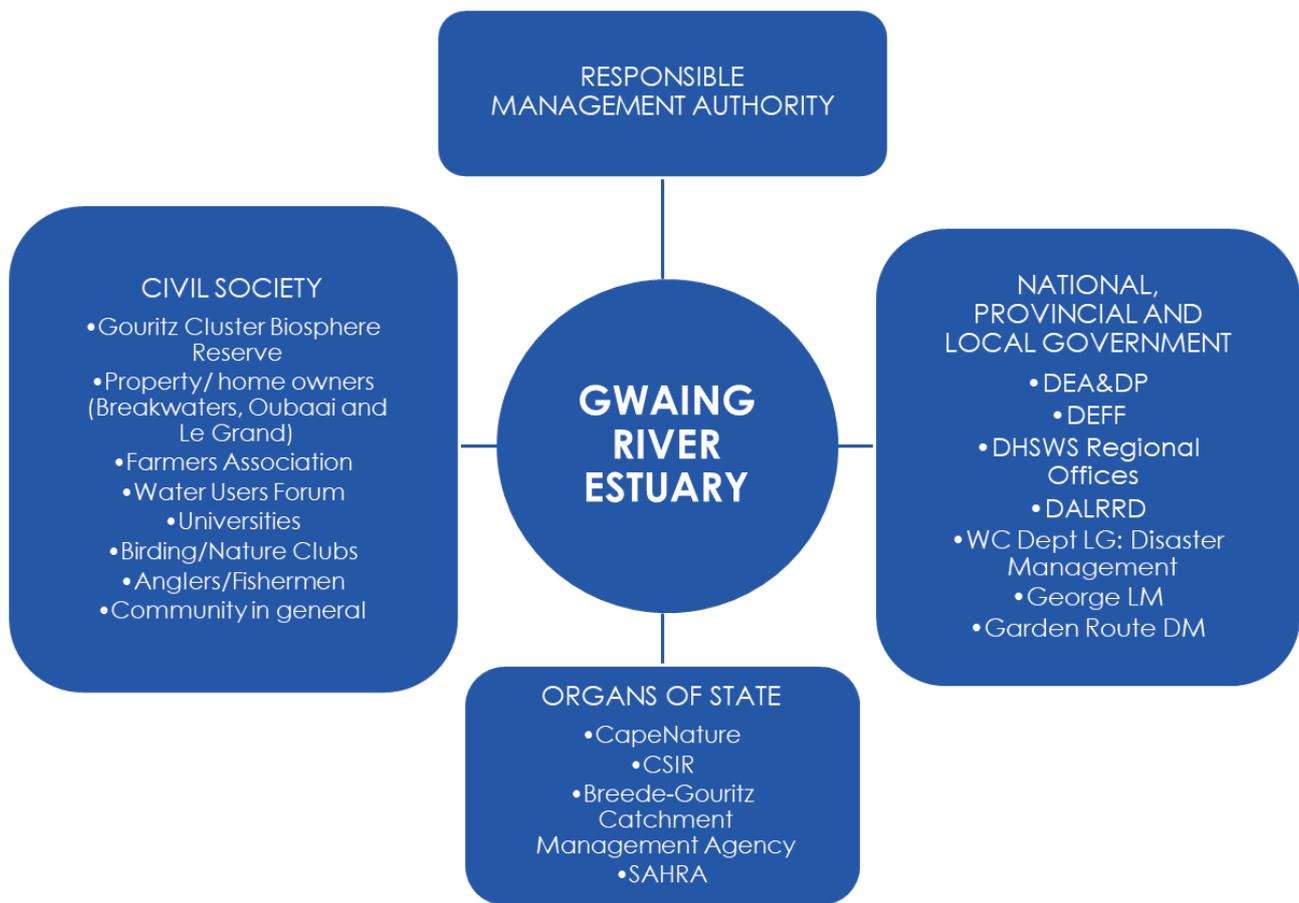
It is essential that this EMP is regarded as a strategic plan that can guide the detailing of management actions and identification of implementing agents. Therefore, it does not specify the required resources (human and financial) required for effective management of the estuary. It does, however, offer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

### 8.1 Key Role Players

Co-management and effective governance has been identified as a vital aspect to the efficient and effective management of the Gwaing estuarine system. Figure 9 displays the key role players that should be included in its management.

### 8.2 Responsible Management Authority

The 2021 NEMP identifies the **Department of Environmental Affairs & Development Planning (DEA&DP) (provincial environmental department)**, or its assigned representative, as the RMA responsible for the co-ordination of the implementation of the Gwaing River Estuary EMP. **It is noted that the NEMP allocates such responsibilities to the DEA&DP (provincial environmental department) unless agreement / or until agreement is reached with the respective body to undertake the coordination of the implementation process. Ultimately, the role of the RMA must be designated through formal signed agreement.**



**Figure 9: Key role players for the management of the Gwaing river estuarine system**

Specific implementation actions identified in this EMP remain the responsibility of mandated government agencies as well as respective departments within the RMA. As an example, the George LM will monitor water quality within the estuary in respect to recreational health and safety, and DWS will monitor water quantity in respect to water user allocations; while the DEFF will ensure compliance with matters related to fisheries. It is crucial that champions/project leaders/teams are identified who will be responsible for the formulation of detailed project plans and the implementation thereof.

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

### 8.3 Estuary Advisory Forum

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

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

The various local members and community fora (e.g. farmers association) will play an invaluable role in providing on the ground, local insight and support to the various authorities as well as to the RMA.

## 8.4 Government Departments and Organs of State

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

- The George Local Municipality (as RMA): responsible for providing key municipal services, as well as the provision of management, technical and legislative support;
- The Garden Route DM: Responsible for health and safety issues relating to water and sanitation, disaster management as well as the provision of management and technical support;
- Western Cape Government departments: Responsible for legislatively mandated responsibilities as well as support, including compliance, funding, research and monitoring;
- Relevant National government departments, especially DEFF, DWS (via the regional office), Department of Agriculture, Land Reform and Rural Development (DALRRD), and Department of Science and Technology (DST); and
- Organs of State: CapeNature, BGCMA, CSIR, South African Heritage Resources Agency (SAHRA).

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

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

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

#### **8.4.1 Project Plans for Implementation**

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

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## 9 RECOMMENDATIONS AND CONCLUSION

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

- Water quality impacts from the WWTW as well as agricultural run-off significantly reduced;
- Livelihoods related to the cultural heritage resources ('Standloper' caves) realised;
- Upgrade, development and control of existing public amenity and facilities;
- Safe bathing ensured;
- Continued effective management of public launch site;
- Invasive alien species eradication programme developed and implemented; and
- The DEA&DP to consider the appointment of a Regional estuarine management co-ordinator/champion within either DEA&DP or CapeNature, to support the RMA.

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

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## 10 REFERENCES

- CapeNature (2012). Kogelberg Nature Reserve Complex Management Plan 2013-2018.
- Department of Environmental Affairs (DEA) (2012). South African water Quality Guidelines for Coastal Marine Water. Volume 2: Guidelines for Recreational Use.
- Department of Environmental Affairs (DEA) (2013). National Environmental Management Integrated Coastal Management Act 2008 (Act No. 24 of 2008): National Estuarine Management Protocol (NEMP).
- Department of Environmental Affairs (DEA) (2015). Guidelines for the Development and Implementation of Estuarine Management Plans in terms of the National Estuarine Management Protocol. Department of Environmental Affairs, Cape Town.
- Department of Water Affairs and Forestry (DWAf) (1995). South African Water Quality Guidelines for Coastal Marine Waters. Volume 1: Natural Environment.
- Department of Water Affairs and Forestry (DWAf) (1996). South African Water Quality Guidelines. Volume 7: Aquatic Ecosystems.
- Department of Water Affairs (DWA) (2009). Reserve Determination studies for selected surface water, groundwater, estuaries and wetlands in the Outeniqua (Groot Brak and other water resources, excluding wetlands) catchment: Ecological Water Requirements Study – Estuarine RDM Report: Maalgate, Gwaing, Kaaimans and Noetsie Assessment. Report No. RDM/K10 – K30, K40E/00/CON/0507.
- Department of Water and Sanitation (DWS) (2015). *Reserve Determination Studies for the Selected Surface Water, Groundwater, Estuaries and Wetlands in the Gouritz Water Management Area: Monitoring Report*. Prepared by Koekemoer Aquatic Services and Scherman Colloty & Associates cc.. Report no. RDM/WMA16/00/CON/1213.
- Department of Water and Sanitation (DWS) (2018). Determination of Water Resources Classes and Resource Quality Objectives in the Breede-Gouritz Water Management Area: Outline of Resource Quality Objectives Report. Report No: RDM/WMA8/00/CON/CLA/0717.
- George Local Municipality (2017). 2017 to 2022 Draft Integrated Development Plan.
- South African National Biodiversity Institute (SANBI) (2019). National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries, Pretoria. pp. 1–214.
- StatsSA, (2011). George Municipality. Key Statistics from the 2011 National Census. Statistics South Africa. URL: [http://www.statssa.gov.za/?page\\_id=993&id=george-municipality](http://www.statssa.gov.za/?page_id=993&id=george-municipality) . Accessed 27 November 2018.

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StatsSA, (2016). George Municipality Community Survey data 2016. URL <https://wazimap.co.za/profiles/municipality-WC044-george/> . Accessed 27 November 2018.

UNESCO (2018). Garden Route Biosphere Reserve zonation. URL: [http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/images/Garden\\_Route\\_Zonation.jpg](http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/images/Garden_Route_Zonation.jpg) . Accessed 20 November 2018.

WCG (2015). Coastal Management (Set-back) Lines for the Eden District, 31 March 2015. Western Cape Government Environmental Affairs and Development Planning.

## APPENDIX 1: RECOMMENDED MONITORING PROGRAMMES

**Table 14: Generic baseline surveys to improve confidence in the preliminary reserve determination of estuaries (Priority components are highlighted) (DWS, 2015)**

Monitoring action	Temporal Scale (frequency and timing)	Spatial Scale (Number of stations)
<b>Hydrology</b>		
For larger systems record river inflow at head of estuary (smaller systems hydrology to be simulated every 10 years).	Continuous.	Install recorder near head of estuaries.
<b>Hydrodynamics</b>		
Record water levels Large system (permanent recorder DWS levelled to mean sea level). Smaller systems (small in situ probe).	Continuous.	Near mouth.
Aerial photography (or using high resolution satellite imagery i.e. 5x5 m pixel size, e.g. Google Pro or BirdEye).	Once-off.	Entire estuary.
<b>Sediment dynamics</b>		
Monitoring berm height using appropriate technologies.	Quarterly.	Mouth.
Bathymetric surveys: Series of cross section profiles and a longitudinal profile collected at fixed 500 m intervals, but in more detail in the mouth including the berm (every 100 m). Vertical accuracy at least 5 cm.	Once-off.	Entire estuary.
Collect sediment grab samples (at cross section profiles) for analysis of particle size distribution and organic content (and ideally origin, i.e. microscopic observations).	Once-off.	Entire estuary.
<b>Water quality</b>		
Electrical conductivity, pH, inorganic nutrients and organic content (e.g. Total P and Kjeldahl N) in river inflow (preferably also suspended solids and temperature).	Monthly (as in DWS monitoring programme).	Include monitoring station near head of estuary.
Salinity and temperature profiles (and any other in situ measurements possible e.g. pH, DO, and turbidity).	Quarterly, preferably for two years.	Along entire length of estuary (at least three stations covering all zones).
Inorganic nutrient concentrations (together with above).	Quarterly, preferably for two years.	Along entire length of estuary (at least three stations covering all zones).
Measure pesticides/herbicides and metal accumulation in sediments (for metals investigate establishment of distribution	Once-off.	Entire estuary, including depositional areas (i.e. muddy areas).

Monitoring action	Temporal Scale (frequency and timing)	Spatial Scale (Number of stations)
models – refer to Newman and Watling, 2007)		
<b>Microalgae</b>		
<p>Record relative abundance of dominant phytoplankton groups, i.e. flagellates, dinoflagellates, diatoms, chlorophytes and blue-green algae.</p> <p>Chlorophyll-a measurements taken at the surface, 0.5 m and 1 m depths, under typically high and low flow conditions using a recognised technique, e.g. spectrophotometer, HPLC or fluoroprobe.</p> <p>Intertidal and subtidal benthic chlorophyll-a measurements (four replicates each) using a recognised technique, e.g. sediment corer or fluoroprobe.</p>	<p>Quarterly preferably for two years.</p>	<p>Along length of estuary minimum five stations.</p>
<b>Macrophytes</b>		
<p>Map area covered by different macrophyte habitats using recent imagery. Conduct field survey to record total number of macrophytes habitats, identification and total number of macrophytes species, number of rare or endangered species, or those with limited populations. Assess extent of invasive species in EFZ.</p> <p>Where there are salt marsh areas greater than 1 ha measure % plant cover along elevation gradient. Sediment samples collected along the transect and analysed in the laboratory for sediment moisture, organic content, EC, pH and redox potential. In the field measure depth to water table and ground water salinity</p>	<p>Once-off, in summer.</p>	<p>Entire estuary (mapping). Where there is salt marsh (minimum three transect sites).</p>
<b>Invertebrates</b>		
<p>Collect duplicate zooplankton samples at night from mid-water levels using WP2 nets (190 µm mesh) along estuary</p> <p>Collect sled samples (day) at same zooplankton sites for hyper benthos (190 µm)</p> <p>Collect grab samples (five replicates) (day) from the bottom substrate in mid-channel areas at same sites as zooplankton (each sample to be sieved through 500 µm).</p> <p>Intertidal invertebrate hole counts using 0.25 m<sup>2</sup> grid (five replicates per site).</p> <p>Establish the species concerned (<i>C. kraussi</i> or <i>U. africana</i>) using a prawn pump.</p>	<p>Quarterly, preferably for two years.</p>	<p>Minimum of three sites along length of entire estuary.</p> <p>For hole counts –three sites in each of muddy or sandy areas.</p>

Monitoring action	Temporal Scale (frequency and timing)	Spatial Scale (Number of stations)
Collect sediment samples using the grab for particle size analysis and organic content (at same sites as zooplankton) (preferably link with sediment dynamics).		
<b>Fish</b>		
<p>Record species and abundance of fish, based on seine net and gill net sampling. Sampling with a small beam trawl for channel fish should also be considered.</p> <p>Seine net specifications: 30 m x 2m, 15 mm bar mesh seine with a 5 mm bar mesh with a 5 mm bar mesh 5 m either side and including the cod-end.</p> <p>Gill nets specifications: Set of gill nets each panel 30 m long by 2 m deep with mesh sizes of 44 mm, 48 mm, 51 mm, 54 mm, 75 mm, 100 mm and 145 mm.</p> <p>Gill net sampling can be replaced by a large mesh seine (44 mm stretch mesh, 100 m x 2 m).</p> <p>Trawl specification: 2 m wide by 3 m long, 10 mm bar nylon mesh in the main net body and a 5 mm bar in the cod-end.</p>	Once-off, in spring/summer and autumn/winter.	Larger system (> 5 km): 10 - 15 stations along length of estuary (~ length/10). Small systems (< 5 km): 3 - 5 stations (mouth, mid, top).
<b>Birds</b>		
Undertake count of all water birds.	Once-off.	Entire estuary.

**Table 15: Recommended long-term monitoring programme for the Gwaing Estuary (priority components are highlighted) (DWS, 2015)**

ECOLOGICAL COMPONENT	MONITORING ACTION	TEMPORAL SCALE	SPATIAL SCALE
<b>Hydrology</b>	Record river inflow at head of estuary	Continuous	Head of estuary
<b>Hydrodynamics</b>	Record water levels using small in situ probe	Continuous	Near mouth
	Aerial photography (or using high resolution satellite imagery i.e. 5x5 m pixel size, e.g. Google Pro or BirdEye)	Every 3 years	Entire estuary
<b>Sediment dynamics</b>	Monitoring Berm height using appropriate technologies	Quarterly	Mouth
	Bathymetric surveys: Series of cross section profiles and a longitudinal profile collected at fixed (e.g. 300-500m intervals) but in more detail in mouth including berm (every 100 m). Vertical accuracy at least 5 cm	Every 3 years (and after large resetting event)	Entire estuary
	Set sediment grab samples (at cross section profiles) for analysis of particle size distribution (and ideally origin, i.e. microscopic observations)	Every 3 years	Entire estuary
<b>Water quality</b>	Electrical conductivity, pH, inorganic nutrients and organic content (e.g. TP and Kjeldahl N) in river inflow ( <i>preferably also suspended solids and temperature</i> )	Monthly continuous (as in DWS monitoring programme)	Just above head of estuary
	Salinity and temperature profiles (and any other in situ measurements possible e.g. pH, DO, turbidity)	Seasonally, annually	Along entire length of estuary (at least 3 station covering all zones)
	Inorganic nutrient concentrations (together with above)	High flow/low flow surveys, every 3 years or when significant change in WQ expected	Along entire length of estuary (at least 3 station covering all zones)
	Measure pesticides/herbicides and metal accumulation in sediments (for metals investigate establishment of distribution models – see Watling and Newman, 2007)	Once off, then every 3 – 6 years, if results show contamination	Entire estuary, including depositional areas (i.e. muddy areas)

ECOLOGICAL COMPONENT	MONITORING ACTION	TEMPORAL SCALE	SPATIAL SCALE
<b>Microalgae</b>	<p>Record relative abundance of dominant phytoplankton groups, i.e. flagellates, dinoflagellates, diatoms, chlorophytes and blue-green algae. Chlorophyll-a measurements taken at the surface, 0.5 m and 1 m depths, under typically high and low flow conditions using a recognised technique, e.g. spectrophotometer, HPLC, fluoroprobe.</p> <p>Intertidal and subtidal benthic chlorophyll-a measurements (4 replicates each) using a recognised technique, e.g. sediment corer or fluoroprobe.</p>	<p>Quarterly for 1<sup>st</sup> two years and then low flow surveys every 3 years</p>	<p>Along length of estuary minimum 5 stations</p>
<b>Macrophytes</b>	<p>Map area covered by different macrophyte habitats using recent imagery. Conduct field survey to record total number of macrophytes habitats, identification and total number of macrophytes species, number of rare or endangered species, or those with limited populations. Assess extent of invasive species in EFZ.</p> <p>Where there are salt marsh areas greater than 1 ha measure % plant cover along elevation gradient. Sediment samples collected along the transect and analysed in the laboratory for sediment moisture, organic content, EC, pH and redox potential. In the field measure depth to water table and ground water salinity</p>	<p>Every 3 years in summer</p>	<p>Entire estuary (mapping)</p> <p>Where there is salt marsh (minimum 3 transect sites)</p>

ECOLOGICAL COMPONENT	MONITORING ACTION	TEMPORAL SCALE	SPATIAL SCALE
<b>Invertebrates</b>	<p>Collect duplicate zooplankton samples at night from mid-water levels using WP2 nets (190 um mesh) along estuary</p> <p>Collect sled samples (day) at same zooplankton sites for hyper benthos (190 um)</p> <p>Collect grab samples (5 replicates) (day) from the bottom substrate in mid-channel areas at same sites as zooplankton (each sample to be sieved through 500 um).</p> <p>Intertidal invertebrate hole counts using 0.25 m<sup>2</sup> grid (5 replicates per site). Establish the species concerned (<i>Callichirus kraussi</i> or <i>Upogebia Africana</i>) using a prawn pump.</p> <p>Collect sediment samples using the grab for particle size analysis and organic content (at same sites as zooplankton) (<i>preferably link with sediment dynamics</i>)</p>	<p>Quarterly for 1<sup>st</sup> two years and then Every 2 years mid-summer</p>	<p>Minimum of 3 sites along length of entire estuary</p> <p>For hole counts – three sites in each of muddy or sandy areas,</p>
<b>Fish</b>	<p>Record species and abundance of fish based on seine net and gill net sampling. Sampling with a small beam trawl for channel fish should also be considered.</p> <p>Seine net specifications: 30 m x 2m, 15 mm bar mesh seine with a 5 mm bar mesh with a 5mm bar mesh 5 m either side and including the cod-end</p> <p>Gill nets specifications: Set of gill nets each panel 30 m long by 2 m deep with mesh sizes of 44 mm, 48 mm, 51 mm, 54 mm, 75 mm, 100 mm and 145 mm</p> <p>Gill net sampling can be replaced by a large mesh seine (44 mm stretch mesh, 100 m x 2 m)</p> <p>Trawl specification: 2 m wide by 3 m long, 10 mm bar nylon mesh in the main net body and a 5 mm bar in the cod-end</p>	<p>Twice annually Spring/ summer and autumn/ winter</p>	<p>3-5 stns (mouth, mid, top)</p>
<b>Birds</b>	<p>Undertake count of all water birds</p>	<p>Every 2 years mid-summer</p>	<p>Entire estuary</p>

## APPENDIX 2: ECOLOGICAL SPECIFICATIONS

**Table 16: EcoSpecs and Thresholds of Potential Concern for the Gwaing Estuary (Category B/C) (DWS, 2015; 2018)**

ECOLOGICAL COMPONENT		RECOMMENDED RQO						THRESHOLD OF POTENTIAL CONCERN					
<b>Hydrology</b>		• Maintain flow regime						• Varies more than 10% of MAR					
Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
MMR/MAR (%Nat)	84.9	84.3	82.8	83.0	81.6	84.8	86.3	87.0	89.1	87.8	86.8	86.1	85.0
<b>Hydro-dynamics</b>		<ul style="list-style-type: none"> <li>• Maintain mouth state to create the required habitat for birds, fish, macrophytes, microalgae and water quality</li> <li>• Maintain connectivity with marine environment</li> </ul>						<ul style="list-style-type: none"> <li>• Closed mouth state varies by &gt; 20% from present</li> <li>• Average water depth &lt; 1.0 m (to be confirmed by monitoring)</li> <li>• Average water level change by more than 20% from present</li> </ul>					
<b>Water Quality</b>		<ul style="list-style-type: none"> <li>• Salinity distribution not to cause exceedance of TPCs for fish, invertebrates, macrophytes and microalgae</li> <li>• Turbidity and Dissolved oxygen not to cause exceedance of TPCs for biota</li> <li>• DIN/DIP concentrations not to cause in exceedance of TPCs for macrophytes and microalgae</li> <li>• Concentrations of waterborne pathogens should be maintained in an Acceptable category for full contact recreation</li> <li>• Toxic substances not to cause exceedance of TPCs for biota</li> </ul>						<ul style="list-style-type: none"> <li>• Average salinity &lt; 15 (expected average range 10-30, but to be verified by baseline studies)</li> <li>• Dissolved oxygen (DO) &lt; 5 mg/l in estuary (surface water especially)</li> <li>• Turbidity &gt; 10 Nephelometric Turbidity Units (NTU) in low flow</li> <li>• Secchi: to bottom</li> <li>• Dissolved Inorganic Nitrogen (DIN) &gt;150 µg/l once off</li> <li>• Dissolved Inorganic Phosphorous (DIP) &gt; 30 µg/l once off</li> <li>• ≥185 Enterococci/100 ml)</li> <li>• ≥500 E. coli/100 ml)</li> <li>• Concentrations in water column exceed target values as per SA Water Quality Guidelines for coastal marine waters (DWAF, 1995)</li> <li>• Concentrations in sediment exceed target values as per WIO Region guidelines (UNEP/Nairobi Convention Secretariat and CSIR, 2009)</li> </ul>					
<b>Sediment dynamics</b>		<ul style="list-style-type: none"> <li>• Flood regime to maintain the sediment distribution patterns and aquatic habitat (instream physical habitat) so as not to exceed TPCs for biota</li> <li>• Changes in sediment grain size distribution patterns not to cause exceedance of TPCs in benthic invertebrates</li> <li>• Change in average sediment composition and characteristics</li> <li>• Change in average bathymetry</li> </ul>						<ul style="list-style-type: none"> <li>• Average sediment composition (% fractions) along estuary change from baseline (to be measured) by 30% (per survey)</li> <li>• Average depth along main channel change from 30% of baseline (to be determine) (system expected to significant fluctuation in bathymetry between flood and extended closed periods)</li> </ul>					
<b>Microalgae</b>		<ul style="list-style-type: none"> <li>• Maintain median phytoplankton/benthic microalgae biomass</li> </ul>						<ul style="list-style-type: none"> <li>• Phytoplankton &gt;8 µg/l (median)</li> <li>• Benthic microalgae &gt;42 mg/m<sup>2</sup> (median)</li> <li>• Phytoplankton &gt;20 µg/l and/or cell density &gt;10 000 cells/ml (once-off)</li> </ul>					

ECOLOGICAL COMPONENT	RECOMMENDED RQO	THRESHOLD OF POTENTIAL CONCERN
	<ul style="list-style-type: none"> <li>Prevent formation of phytoplankton blooms</li> </ul>	<ul style="list-style-type: none"> <li>Dinoflagellates, chlorophytes and/or cyanobacteria &gt;10% of relative abundance.</li> </ul>
<b>Macrophytes</b>	<ul style="list-style-type: none"> <li>Maintain distribution of macrophyte habitats.</li> <li>Prevent the spread of reeds into open water.</li> <li>Prevent an increase in nutrients, macroalgal blooms and aquatic invasive plants.</li> <li>Prevent the spread of invasive trees (e.g. <i>Acacia</i> spp.) in the riparian zone.</li> </ul>	<ul style="list-style-type: none"> <li>20% change in the macrophyte area. (Reeds currently cover 0.14 ha. And salt marsh 1.58 ha)</li> <li>Reeds occupy &gt; 0.5 ha.</li> <li>Macroalgal blooms cover &gt; 50% of the open water area.</li> <li>Presence of invasive aquatic macrophytes e.g. <i>Azolla</i>, water hyacinth.</li> <li>Invasive trees cover &gt; 20% of riparian zone.</li> </ul>
<b>Invertebrates</b>	<ul style="list-style-type: none"> <li>Establish presence absence of sand prawn <i>Callinectes kraussi</i> on sand banks in lower estuary</li> <li>Establish presence absence of the copepod <i>Pseudodiaptomus hessei</i> or estuarine congeneric in the zooplankton of the estuary</li> </ul>	<ul style="list-style-type: none"> <li>If present populations deviate from average baselines (as determined in first 3 visits) by more 30%</li> </ul>
<b>Fish</b>	<p>Fish assemblage should comprise the 5 estuarine association categories in similar proportions (diversity and abundance) to that under the present. Numerically assemblage should comprise:</p> <ul style="list-style-type: none"> <li>Ia estuarine residents (50-80% of total abundance)</li> <li>Ib marine and estuarine breeders (5-20%)</li> <li>Ila obligate estuarine-dependent (10-20%)</li> <li>Ilb estuarine associated species (5-15%),</li> <li>Ilc marine opportunists (20-80%)</li> <li>III marine vagrants (not more than 5%)</li> <li>IV indigenous fish (1-5%)</li> <li>V catadromous species (1-5%)</li> </ul> <p>Category Ia species should contain viable populations of at least 2 species (<i>G.aestuaria</i>, &amp; <i>Hyporhamphus capensis</i>,</p> <p>Category Ila obligate dependents should be well represented by at least 2 large exploited species (<i>L. lithognathus</i>, <i>Lichia amia</i>).</p> <p>REI species dominated by both <i>Myxus capensis</i> and <i>G. aestuaria</i>.</p>	<ul style="list-style-type: none"> <li>Ia estuarine residents &lt;50%</li> <li>Ib marine and estuarine breeders &lt;10%</li> <li>Ila obligate estuarine-dependent &lt;10%</li> <li>Ilb estuarine associated species &lt;5%</li> <li>Ilc marine opportunists &lt; 20%</li> <li>III marine vagrants &gt; 5%</li> <li>IV indigenous fish &lt;1%</li> <li>V catadromous species &lt;1%</li> </ul> <p>Species composition &gt; 50% similar to last 3 sampling trip (system naturally highly unstable due to resetting events)</p>
<b>Birds</b>	<ul style="list-style-type: none"> <li>Maintain population of original groups of birds present on the estuary</li> </ul>	<ul style="list-style-type: none"> <li>Number of birds in any group, other than species that are increasing regionally such as Egyptian geese, drops below the</li> </ul>

ECOLOGICAL COMPONENT	RECOMMENDED RQO	THRESHOLD OF POTENTIAL CONCERN
		baseline median (determined by past data and or initial surveys) number of species and/or birds counted for 3 consecutive summer or winter counts.

## APPENDIX 3: PERFORMANCE MONITORING PLAN

**Table 17: Recommended Performance Monitoring Plan for the management of Gwaing River estuary**

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
<b>1. ESTUARINE HEALTH AND FUNCTION</b>				
1.1 Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning	<ul style="list-style-type: none"> <li>Recommended reserve(s) signed off and implemented</li> <li>Sustained base flow to estuary</li> <li>Ecological condition improved to B</li> <li>Water resource utilisation plan developed</li> <li>Effective regulation of water use</li> <li>Natural mouth dynamics – feasibility of artificial breaching irt to poor water quality investigated</li> <li>Ecological monitoring programme (fish and birds) developed</li> <li>Monitoring on the state of the catchment and estuary</li> </ul>	<ul style="list-style-type: none"> <li>Twice a year for DWS</li> <li>Twice a year</li> </ul>	NWA	DWS, BGCMA, RMA, George LM
1.2 Ensure estuary requirements are integrated into catchment processes to ensure healthy water quality	<ul style="list-style-type: none"> <li>Critical catchment maps updated</li> <li>Effective catchment management including effluent from WWTW</li> <li>Good catchment water quality preserved</li> <li>Water use plan cognisant of estuarine water requirements</li> </ul>	<ul style="list-style-type: none"> <li>Twice a year</li> </ul>	NWA, NWA, MSA, CARA, NEM:BA, NEM:PAA	DWS, BGCMA, DEFF, George LM
1.3 Minimise pollution by addressing activities that lead to poor water quality	<ul style="list-style-type: none"> <li>Water quality (WQ) monitoring programme implemented</li> <li>Control of all polluting discharges</li> <li>Effective functioning and sustainable discharge from wastewater treatment works, contingencies in place</li> <li>Environmental best practice irt effluent reduction, urban drainage and agriculture practices is implemented and enforced</li> <li>Waste management plan in place for peak visitor periods</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly for WQ monitoring programme</li> <li>Twice a year</li> </ul>	NWA, CARA	RMA, George LM, DEFF, GRBR

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
1.4 Control the spread and densification of invasive alien plant species	<ul style="list-style-type: none"> <li>• IAPs Detailed maps of invasive vegetation produced and priority areas identified</li> <li>• IAPS eradication programme implemented</li> <li>• Increased area / tonnes of IAPs removed</li> </ul>	<ul style="list-style-type: none"> <li>• Annually</li> </ul>	CARA, NWA	DEFF, RMA, DEFF: WfW, GRBR
1.5 Ensure sustainable resource use through an effective level of compliance management	<ul style="list-style-type: none"> <li>• Status of fish and bait stocks determined</li> <li>• Level of extractive use established, including subsistence use</li> <li>• Increased patrols and monitoring conducted - compliance monitoring programme in place</li> <li>• Signage created and erected in key public spaces</li> <li>• Communication strategy developed for estuary users</li> <li>• Reduced habitat degradation and inappropriate behaviour/activities</li> <li>• Reduction in illegal activities</li> <li>• Improved fish and invertebrate populations</li> </ul>	<ul style="list-style-type: none"> <li>• Twice a year</li> </ul>	ICMA, MLRA	RMA, DEFF, CapeNature, GRBR,
<b>2. BIODIVERSITY CONSERVATION</b>				
2.1 Ensure the conservation of estuarine habitats and indigenous species	<ul style="list-style-type: none"> <li>• Spatial zonation plan adopted, implemented and enforced</li> <li>• Participation of landowners and stakeholders</li> <li>• Ecological monitoring programme (fish and birds) developed</li> <li>• Reduced habitat degradation and inappropriate behaviour/activities</li> </ul>	<ul style="list-style-type: none"> <li>• Twice a year</li> </ul>	ICMA, NEMA, MLRA, LUPA, NEM: PAA, NEM:BA, WC BRA	RMA, CapeNature, GRBR, George LM, DWS,
<b>3. LAND USE AND INFRASTRUCTURE DEVELOPMENT PLANNING</b>				
3.1 Ensure appropriate and sustainable coastal development in and around the Gwaing River estuary, considering ecosystem services and sense of place	<ul style="list-style-type: none"> <li>• Gwaing EMP included in all relevant planning documents</li> <li>• EMP included in management plan for GRBR</li> <li>• No new development, infilling or land transformation in the EFZ</li> <li>• Inspections undertaken, transgressors prosecuted, and remedial actions implemented</li> <li>• Regional EAF partakes in development planning affecting the estuary</li> </ul>	<ul style="list-style-type: none"> <li>• Annually</li> </ul>	ICMA, LUPA, WC BRA, MSA, NEMA	GRBR, George LM, DEA&DP and applicable authorities

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
<b>4. INSTITUTIONAL AND MANAGEMENT STRUCTURES</b>				
4.1 Ensure effective co-ordination of estuarine management responsibilities	<ul style="list-style-type: none"> <li>• Gwaing EMP adopted by RMA</li> <li>• Gwaing EMP incorporated into GRBR management plan</li> <li>• Bylaws developed and gazetted to support zonation and protect EFZ</li> <li>• Regional Estuarine management function established in RMA</li> <li>• RMA official(s) are well-trained and knowledgeable</li> <li>• Regional EAF constituted and chaired by RMA</li> <li>• Good communication and working relationship established with implementing agencies, including DEA&amp;DP for ad hoc support</li> <li>• Regional EAF supported and meets on quarterly basis</li> <li>• RMA presence at critical forum meetings</li> <li>• Effective system of monitoring, report and review in place</li> <li>• Annual reporting undertaken by RMA</li> <li>• Funding secured for 5 year cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly</li> </ul>	ICMA, MSA, NEMA, LUPA, NWA, WC BRA	RMA, George LM, Garden Route DM, applicable authorities
4.2 Define and enable co-operative governance	<ul style="list-style-type: none"> <li>• MOUs signed between RMA and spheres of government and participating agencies</li> <li>• Active collaboration of various institutions, private and civil stakeholders</li> <li>• Individual agencies knowledgeable and with capacity and resources to carry out mandated actions</li> <li>• Formal review of EMP every 5 years</li> </ul>	<ul style="list-style-type: none"> <li>• Annually</li> </ul>	MSA, NWA, ICMA, NEMA, WC BRA, CARA	RMA supported by all applicable authorities

<b>5. SOCIO-ECONOMIC CONSIDERATIONS</b>				
5.1 Regulate recreational use of the estuary	<ul style="list-style-type: none"> <li>• Informative signage and markers erected and maintained</li> <li>• EFZ controls enforced and offenders prosecuted</li> <li>• Carrying capacities determined for each use and regulations gazetted</li> <li>• Agreements formalised for lifeguard facilities</li> <li>• Safe swimming conditions</li> <li>• Public Boat Launch Site legalised, management plan in place, and ongoing monitoring of boating activity</li> <li>• Communication strategy developed for estuary users/landowners</li> </ul>	• Annually	ICMA, WC BRA, MLRA, MSA	RMA, DEFF, George LM
5.2 Preserve and manage all cultural heritage resources	<ul style="list-style-type: none"> <li>• Heritage resources mapped and information collated</li> <li>• Cultural Heritage Management Programme developed</li> <li>• Custodian of Gwaing caves appointed, appropriate partnerships / agreements established</li> <li>• Reasonable access provided and maintained</li> <li>• Employment of local communities</li> </ul>	• Annually	NHRA, MSA, ICMA	RMA, George LM, SAHRA
5.3 Promote involvement of historically disadvantaged communities and individuals in the provision of tourism & recreation services	<ul style="list-style-type: none"> <li>• Livelihood opportunities identified for communities in close proximity to Gwaing River estuary</li> <li>• Education and capacitation of personnel</li> <li>• EPIP programmes adopted and implemented</li> <li>• Employment of local communities</li> </ul>	• Annually	ICMA	RMA, George LM, Garden Route DM,
<b>6. EDUCATION AND AWARENESS</b>				
6.1 Promote high levels of public awareness and appreciation of the value of estuaries	<ul style="list-style-type: none"> <li>• Education &amp; awareness programme developed and implemented</li> <li>• Educational signage erected, and information disseminated</li> <li>• George estuaries webpage operational</li> <li>• Reduced habitat loss/degradation and disturbance, and inappropriate behaviour</li> <li>• Reduced illegal fishing activities</li> </ul>	• Every 3 years	ICMA, MLRA	RMA, GRBR, George LM,

7. DISASTER RISK MANAGEMENT				
7.1 Disaster prevention and preparedness	<ul style="list-style-type: none"> <li>• Risk assessment portfolio compiled, and key areas identified</li> <li>• Health incident evacuation plan developed</li> <li>• Emergency response networks established</li> <li>• Integrated flood disaster management plan developed</li> <li>• All developments and activities are legally compliant</li> </ul>	<ul style="list-style-type: none"> <li>• Annually</li> </ul>	DMA, MSA, NEM: WA, NEMA, ICMA, NWA	RMA, George LM, Garden Route DM, DWS, WC Dept of Local Gov: Disaster Management
7.2 Mitigate areas of high risk	<ul style="list-style-type: none"> <li>• Rehabilitation programme developed &amp; implemented</li> <li>• Risk areas included in regional disaster management plan and contingency plans developed</li> <li>• Critical infrastructure defended</li> <li>• Reduced incidence of pollution, and timeous implementation of mitigation</li> </ul>	<ul style="list-style-type: none"> <li>• Annually</li> </ul>	DMA, MSA, NEM: WA, NEMA, ICMA, NWA,	

## APPENDIX 4: PROJECT PLAN TEMPLATE

<b>ACTION</b>	Describe the action to be undertaken																																																											
<b>COMPLETION DATE</b>	Provide date of expected completion																																																											
<b>PERFORMANCE INDICATOR</b>																																																												
Requirements stipulated in policy and legislation																																																												
Available methods, protocols and best practice-guides																																																												
Spatial zonation consideration (e.g. limits/targets)																																																												
Detailed work plan	Task 1: Task 2: Task 3: Task 4:																																																											
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