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DOCUMENT USE

The National Estuarine Management Protocol (the Protocol), promulgated in May 2013 under the National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008, as amended by Act No. 36 of 2014), sets out the minimum requirements for individual estuarine management plans.

In 2014, a review was conducted by the National Department of Environmental Affairs: Oceans and Coasts (DEA, 2014) on management plans existing at the time to ensure, *inter alia*, the alignment of these plans with the National Protocol.

This revision of the Draft Olifants River Estuarine Management Plan, consisting of a Situation Assessment Report and the Management Plan itself, is primarily a response to the DEA review process, to ensure compliance with the minimum requirements for estuarine management plans as per the Protocol. In summary, this entailed:

- Including socio-economic information in the Situation Assessment;
- Updating the terminology as per the Protocol;
- Including a summary of the Situation Assessment;
- Including a map of geographical boundaries based on the Estuarine Functional Zone;
- Updating the management objectives and activities to include those related to management of living resources;
- Extending the monitoring plan to explicitly include a performance monitoring plan to gauge progress towards achieving Estuarine Management Plan objectives (i.e. using performance indicators)
- Including description of institutional capacity and arrangements to manage elements of Estuarine Management Plan provided as per the Protocol.

The work of the original authors and input received from the University of Cape Town (UCT) research team and other stakeholders remains largely unchanged, although certain editorial changes and factual updates will be evident. Historical information and data remains relevant and critically important for estuarine management in the long term and must be updated when new information becomes available. This revision does not represent, or replace, the full five-year review process required to re-evaluate the applicability of the plan and to provide new information. Such a full review process is therefore still urgently required and should be part of a future revision undertaken by the nominated management and implementation agents. Nonetheless, this Estuarine Management Plan must be considered a living document that should be regularly updated and amended as deemed necessary.

EXECUTIVE SUMMARY

Introduction

Estuaries are recognised as particularly sensitive and dynamic ecosystems, and therefore require above-average care in the planning and control of activities related to their use and management. For this reason, the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008, as amended by Act 36 of 2014) (ICM Act), via the prescriptions of the National Estuarine Management Protocol (the Protocol), require Estuary Management Plans to be prepared for estuaries in order to create informed platforms for efficient and coordinated estuarine management.

The Olifants River estuary is one of 279 functional estuaries in South Africa (Turpie 2004) and one of four permanently open estuaries on the west coast (Whitfield 2000). It is the 12th largest estuary in the country, with a total area of 702 ha. The estuary is one of the most important in the country in terms of its conservation value from an ecological, social and cultural heritage perspective. The estuary and surrounding landscape has formed the basis of the culture and livelihoods of the local Ebenhaeser community for several centuries. In addition to its socio-cultural and heritage importance, the estuary provides critical ecosystem goods and services. The estuary is also noteworthy in that it is one of the least developed of the large permanently-open estuaries in South Africa, providing a valuable sanctuary for flora and fauna as well as for visitors.

This document is a Management Plan for the Olifants River Estuary and should be read in conjunction with the Situation Assessment Report which forms the background material for the development of the management plan. Anchor Environmental Consultants cc was tasked with preparing then initial plan under the auspices of the Cape Action Plan for the Environment (C.A.P.E.) Regional Estuarine Management Programme. The main aim of programme is to develop a conservation plan for the estuaries of the Cape Floristic Region, and to prepare strategic management plans for each estuary.

Situation Assessment

The Olifants River Estuary is one of the largest of South Africa's 279 estuaries, with a total area of 702 ha of typical estuarine habitat plus 797 ha of floodplain saltmarsh, together making up 1499 ha. It is one of the most important estuaries in the country from a conservation perspective. The estuary is also noteworthy in that it is perhaps the least developed of the large permanently open estuaries in South Africa, providing a valuable sanctuary for flora and fauna as well as for visitors. However, mounting pressures could reduce this value, as water abstraction and pollution degrades estuary condition, fish stocks are affected by small-scale fishing, and demand for development proceeds up the West Coast. Nevertheless, there is still good opportunity for proactive planning to form a vision for the estuary and set in place a management strategy that will achieve that vision.

The Olifants Estuary lies 250 km north of Cape Town on the West Coast and forms the mouth of the Olifants-Doring River system. The Olifants-Doring Catchment straddles the Northern and Western Cape Provinces, and the estuary is located in the Matzikamma Local

Municipality, within the West Coast District Municipality in the Western Cape Province. The estuary extends from its permanently open mouth (31°42'S; 18°11.34'E) some 36 km upstream to the low water causeway near Lutzville (31°33.8'S; 18°19.78'E). The channel varies from 550 m wide just upstream of the mouth to 20 m at the head of the estuary. Depth is mostly 2-3 m. The lateral extent of the estuary is defined by the limit of estuarine vegetation, including flood plain saltmarsh.

The estuary drains one of the largest catchments in the country. Rainfall in the catchment ranges from 1500 mm in the south down to 300 mm in the north. The area is largely arid, dominated by Succulent Karoo vegetation, as well as having Fynbos vegetation in the south and Nama Karoo vegetation in the north. The winter rainfall in the south is the dominant source of flow into the estuary, via the Olifants River, whereas the Doring River, its major tributary, is intermittently dry. The Doring River is more saline and carries more suspended solids than the Olifants River due to differences in catchment soils. Flow is regulated by the Clanwilliam and Bulshoek Dams on the Olifants River and there has been a proposal to increase the capacity of the Clanwilliam Dam.

Around 90% of the catchment area is untransformed, much of this in nature reserves and the rest used for livestock. There is some dryland farming (e.g. rooibos tea) and significant irrigation along the Olifants River (e.g. citrus, grapes). Mining for gypsum, salt, sand, mineral sands and diamonds also features in the area. Agriculture is the backbone of the area's economy, though tourism is also growing in importance.

This is the most sparsely populated catchment in the country, with most of the population living in the Koue Bokkeveld and Olifants River Valley. The population is predominantly Coloured (70%) and White (20%), and more than 90% of people are Afrikaans-speaking. The majority are poor, but employment levels and services are reasonable compared with the rest of South Africa. Much of the land around the estuary is communal land belonging to the Ebenhaeser community.

The people of Ebenhaeser and Papendorp have a long history of fishing in the Olifants River estuary. These communities were descendants of indigenous Khoi-San groups that settled in the area in the Olifants River valley in about the 17th century (Parkington, 1977). The realities of this fishing community today are rooted in the history of a land exchange which took place in 1927 when the Colonial government at the Cape forcibly resettled this community onto unfertile land near the mouth of the Olifants River to provide agricultural opportunities for "poor whites" seeking livelihood opportunities. Due to the poor soils and lack of water at the resettlement sites, many people became increasingly reliant on fishing as a main source of food and livelihoods (Sowman, 2009).

The historical record paints a picture of a marginalised community, dependent on local resources for food and livelihoods with little assistance from government (LRC, 2003). Currently, there are approximately 1200 households in the Ebenhaeser and Papendorp settlements of which approximately 120 are involved in fishing as a source of food or contribution to livelihood (Williams, 2013; EcoAfrica, 2012). This is a poor community with a high level of unemployment (approximately 26%) and relatively low levels of education (EcoAfrica, 2013). Those people not engaged in fishing are involved in small-scale

agriculture, *ad hoc* work on adjacent commercial farms, or gain short-term employment from government public works and poverty alleviation projects. Many residents rely on social grants from the government to provide for their basic requirements (Williams, 2013).

There are currently 45 permits issued for this gillnet fishery. According to current permit conditions, 90 fishers are able to fish on the estuary at any one time. However, in practice there are far fewer fishers on the estuary on a regular basis and the numbers are declining due to unreliable catches and as more fishers get involved in fishing at sea.

The mouth of the estuary is permanently open. The Lutzville Bridge marks the extent of tidal water level fluctuations. The mean annual runoff reaching the estuary varies around 715 Mm³/annum, some 33% less than in the natural state. Both low flows and winter flood peaks have been reduced, reducing the input of sediment to the estuary. This is thought to have deepened the channel, allowing tidal penetration further upstream. Unlike under natural conditions, when it was rare, this allows the estuary to experience a marine-dominated state for about six months of the year (November to April), replacing a situation where saline water only extended to the middle reaches. A freshwater-dominated state prevails during winter. However, current observations by local fishermen point to evidence of the expansion of sand banks around the river mouth. This could be the result of reduced river flow not scouring out the mouth area.

Salinity distribution in the estuary affects the distribution and abundance of plants and animals. Marine dominance in summer means that salinity penetrates far into the estuary, measuring 5 ppt some 20 km upstream throughout the water column. In winter, freshwater flows out on top of the saline water, and the latter only penetrates a short distance upstream. The estuary is warmer in summer than in winter and has lower oxygen concentrations in summer. Oxygen is depleted in deeper, slower moving water, especially in the middle of the estuary in summer. Water clarity is affected by the relative input from the Olifants River Catchment (clear), Doring River Catchment (turbid) and the sea (clear), with the estuary being clearer in summer than winter.

Nutrients (e.g. nitrogen, phosphorus, silica) enter the estuary in sea (especially during upwelling) and river water (especially following first rains), but the contribution by river water has increased enormously in recent decades due to agricultural practices, leading to problems of weed growth in the estuary.

Microalgae form the bottom of the food chain and comprise the phytoplankton in the water column and the benthic microalgae on the bottom. The phytoplankton is dominated by flagellates in river dominated areas and diatoms in marine-dominated areas and their abundance, is influenced by the concentrations of nutrients. Little is known about the benthic microalgae, but their abundance in winter does reflect the high nutrient loads of the system.

Vegetation of the estuary can be divided into four types of communities:

- 1) Macroalgae include the seaweeds at the mouth as well as species indicative of nutrient enrichment near the top of the estuary. The latter include *Enteromorpha*,

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- which fouls boat propellers and pumps and the mat-forming, floating macrophyte known as duckweed, which is abundant in the upper reaches;
- 2) Submerged macrophytes comprise pondweed, which forms dense beds in the upper reaches, and which has increased due to nutrient enrichment, and eelgrass, which grows in the lower reaches, providing important habitat for juvenile fish;
 - 3) Reeds and sedges are important for function and diversity, but do not tolerate high salinity and have receded upstream due to reduction in freshwater inflows; and
 - 4) Salt marsh occurs mainly in open estuaries, and the Olifants River estuary contains a high proportion of this habitat in South Africa. It contributes to system productivity and biotic diversity, providing habitat and shelter for numerous invertebrates and bird species. The salt marshes of the Olifants River estuary are also fairly unusual, with the saltmarsh on the floodplain considered a remnant of a larger system in the past. Despite grazing and some clearing, disturbance to salt marsh has been only minor.

The invertebrate community comprises zooplankton and the benthic communities in and on the sediments. The invertebrate communities of the Olifants River estuary are characterised by high abundance relative to other South African estuaries, and high species richness for the west coast, where diversity is usually fairly low. The dominant invertebrate species are *Pseudodiaptomus hessei* (zooplankton), the amphipod *Melita zeylanica*, the crown-crab *Hymenosoma orbiculare* (hyperbenthos), the polychaetes *Ceratonereis keiskamma*, *Desdemona ornata* and the amphipods *Corophium triaenonyx*, *Grandidierella lutosa* and *Melita zeylanica* (benthos). Zooplankton and hyperbenthos abundance is highest in the middle reaches of the estuary and subtidal benthos is highest at the top of the estuary. These invertebrates are important in the diets of fish and birds.

A total of 38 fish species from 30 families have been recorded in the Olifants River Estuary, of which 18 can be regarded as either partially or completely dependent on the estuary for their survival. These include some highly valuable species such as white steenbras as well as harders. The estuaries on the west coast are crucial in maintaining the range and stock integrity of estuarine and estuarine dependent species along the entire west coast, and the Olifants River Estuary is an important nursery area. The decline in the harder stock and marine gill-net fishery catches on the west coast has been attributed to recruitment over-fishing in the Berg and Olifants River Estuary gill net fisheries (Hutchings & Lamberth 2003). Work by Rice (2015) further suggests that pressure on line fish species found in the Olifants estuary by other fishery sectors such as trawl fishery and commercial line fishery contribute significantly to the status of these stocks.

It is likely that there have been significant changes in the fish fauna compared with natural conditions, with a reduction in diversity and fish sizes having occurred due to changes in freshwater flows and fishing. Harder and estuarine round herring are now the dominant fish species in the estuary and elf also make up a significant proportion of fish numbers. The majority of estuary-dependent species are most abundant from 5-20 km from the mouth, in salinities of 0-20 ppt and water clarity less than 100 cm. Adequate management needs to be applied to the estuary, however, to ensure the survival of these species as they are highly mobile moving from the mouth right up to the top of the estuary.

Birds are probably one of the most important components of the estuary's biodiversity. The diversity and numbers of birds are very high, due to the size and diversity of habitats on the estuary, and its lack of disturbance. Some 72 water bird species occur on the estuary (not including vagrant visitors), of which 21 are long-distance migrants that mostly spend the summer on the estuary. Bird numbers swell from, on average, 3200 in winter to 5900 in summer though much higher numbers have been recorded at times. The area near the mouth supports about 80 % of the birds of the estuary (apart from the marine cormorants at the rocks), and 90 % are found within 9 km of the mouth. Different species are characteristic of different habitats. Intertidal habitats support the highest densities. Very low densities of birds occur in the saltpan and supratidal marshes, but the community composition is distinct. The sand banks in the lower estuary are important roosting areas for terns and gulls. The upper reaches are home to waterfowl, which tend to prefer fresh or brackish habitats. Apart from the marine cormorants, the birds on the estuary include invertebrate feeders (mostly waders), piscivores (mostly terns), herbivores (waterfowl) and generalist feeders (gulls), with the first two groups being dominant in summer. The bird community is highly responsive to change reflecting wet and dry years on the estuary.

Estuaries can provide a range of services that have economic or welfare value. In the case of the Olifants River estuary, the most important of these are the small-scale fishery, the recreational value and the nursery value of the estuary. There may be additional values, such as carbon sequestration, but these are not well understood and are probably fairly minor.

The estuary is striking against its arid backdrop, and with its fishing and birdwatching opportunities, provides a high quality recreational experience which is generally uncongested. Unlike most large estuaries in South Africa, there is no major urban settlement around the mouth of the Olifants River Estuary, though Strandfontein village is nearby, and visitors currently camp informally beside the estuary at Papendorp. This informal camping creates significant problems during the Christmas/New Year and Easter holiday periods due to the lack of services and infrastructure and the damage to sensitive vegetation caused by vehicles and campers. The bulk of the Olifants River Estuary recreational linefish catch is made within 500m of the mouth and comprises silver kob (collapsed), white steenbras (collapsed), west coast steenbras (optimally exploited) and elf (overexploited)¹. The status of these stocks is due to the general decline in the country. Recreational anglers value the sport and experience, and expend considerable sums on this activity, largely irrespective of their catch returns. Although small, the Olifants River Estuary recreational fishery is probably worth R0.6 – R1.3 million per annum. However, concerns about the impact of the recreational fishing on lone fish stocks and their interference with the small-scale fishery, have led to calls for greater restrictions on recreational anglers.

Estuaries contain freshwater, terrestrial and marine components, and are heavily influenced by activities in a much broader catchment and adjacent marine area, and are affected by a large number of policies and laws. The Integrated Coastal Management Act of 2008 (amended 2014) requires that a management plan be developed for each estuary

¹ Stock status taken from Mann (2013)

according to a National Protocol. The National Estuarine Management Protocol, promulgated in 2013, provides the national policy for estuary management and guides the development of individual estuarine management plans. It stipulates the minimum requirements for the content of an estuarine management plan, prescribes the procedures to be followed in developing an estuarine management plan and any potential institutional arrangements. Importantly, the Protocol provides clarity as to which authorities are responsible for the development, coordination, and implementation of an estuarine management plan. Given that the Olifants River estuary is prioritised for conservation and forms part of the Western Cape Protected Area Expansion Strategy, the designated Responsible Management Authority is the provincial conservation agency: CapeNature. The Protocol stipulates that the responsible management authority must budget accordingly for the development of these plans.

At a national level, estuary management falls mainly under two national government departments: the DWS, responsible for water resources, and DEA, responsible for everything else, e.g. land use, living resources. Environmental management in most instances is devolved to provincial level. Management and conservation of marine living resources is an exception in this respect, with responsibility for coastal and estuarine management issues residing with the Directorate Oceans and Coast of DEA and marine resources management with DEFF. At a municipal level, by-laws are passed which cannot conflict with provincial and national laws.

Water quality and quantity are mainly controlled under the National Water Act 36 of 1998. This makes provision for an environmental reserve which provides the quantity and quality of water flow required to protect the natural functioning of each water resource, including estuaries. The extent to which an estuary's functioning is catered for is determined by the designated future management "class" (where classes A – F describe state of health), called the Ecological Reserve Category. The reserve was determined based on recommendations made from a reserve-determination study ("Resource Directed Measures") and socio-economic considerations. This study was completed for the Olifants River estuary in 2006. The study determined that the estuary was a C-class estuary ("moderately modified"). Implications of several possible future flow scenarios were determined, and on the basis of this and the national importance of the estuary, the recommendation was made to provide enough flow (i.e. restore some flows) to raise the estuary to a B-class ("largely natural"). Water quality specifications were also recommended based on maintaining a B-class category, which means taking measures to control inputs of organic and inorganic pollutants entering the river and estuary. A final decision on the ecological reserve category has yet to be taken by DWS.

Exploitation of living resources in the estuary is governed by the Marine Living Resources Act (1998) and its Amendments as well as the recently promulgated Small-scale Fisheries Policy (SSFP) (DEFF, 2012) and associated regulations (DEFF, 2016). Main objectives of the Marine Living Resources Act (Act No. 18 of 1998, as amended) (MLRA) and SSFP Policy include sustainable use of resources, promotion of ecosystem and biodiversity protection, use of marine resources for socio-economic development and poverty alleviation as well as transformation of the fishing sector. The new SSFP recognizes the rights and socio-economic needs of small-scale fisheries, and affords them respect and legal protection. Of particular

importance is the requirement that these small-scale fishers be granted preferential access to marine resources especially where such communities have historically depended on such resources.

Under the Seashore Act of 1935, the estuary up to the high-water mark belongs to the state. In terms of the ICM Act, the Minister must determine the boundaries of coastal public property to improve public access to the seashore; protect sensitive coastal ecosystems; and secure natural functioning of dynamic coastal processes to protect people, property and economic activities from risks (section 7A). Furthermore, the ICM Act provides guidance on the sustainable use, development and protection of the coastal zone. The ICM Act provides for the determination of a Coastal Protection Zone (CPZ) on coastal land and adjacent to the High-Water Mark (HWM) and extending 1km from the high tide mark (including in estuaries) for undeveloped land and land zoned for agricultural use, which is narrowed to 100 m in areas zoned for other 'urban' land uses (e.g. residential, industrial or commercial). In the case of the Olifants, all land surrounding the estuary falls into the former categories, and thus in terms of ICM Act, a default CPZ of 1 km would apply around the whole estuary. However, the boundaries of this zone may be adjusted by the MEC and, in the Western Cape; the 10 m topographical contour is the proposed maximum width of the CPZ around estuaries, as per the West Coast District Setbacks Project (DEA&DP 2014). Within the CPZ, no new land transformation or development may take place without authorisation issued by the responsible authority (MEC or Minister depending on the nature of the activity). There is also provision to create a larger CPZ under the ICM Act where necessary. Note though that an exemption has been afforded to landowners in respect to land clearance activities on the land below the irrigation canal and certain other areas adjacent to the Olifants River Estuary in terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA) and National Environmental Management Act (Act No. 107 of 1998) (NEMA). It is likely that this exemption will be applicable in terms of the ICM Act as well, but is probably applicable to land clearance for agriculture only. This needs to be confirmed.

The Municipal Systems Act (Act No. 32 of 2000) (MSA) requires the identification of development priorities for each province, district and local municipality, and the expression of development plans in a spatial layout. The latter in turn, has to be formalised in a detailed land use and management plan. Thus the key land-use decision-making is undertaken by the local municipalities, in this case the Matzikama Municipality. Their plans have to fit in with broader scale plans of the district and province and will need to take account of the land-use plan being prepared for land claimant community in terms of the settlement agreement of 2015 (Phulisani, in prep.).

The Western Cape Spatial Development Framework (SDF) highlights the conservation importance of the Olifants River Estuary at a national level but offers little of specific relevance to the management of the Olifants River Estuary. The district IDP and SDF advocate conservation of environment and natural resources as well as historical buildings and structures, but do not specifically mention the estuary. The Matzikama Municipality SDF acknowledges the importance of the estuary within the region but provides little specific guidance for the management thereof. However, there exists a Management Plan Guideline document (Urban Dynamics 1998) developed specifically for the lower Olifants River on behalf of the West Coast District Municipality as part of the original IDP

development process. This document was designed to provide the framework for the IDP, and includes a management framework, zonation plan and guidelines for conservation and development of the estuary and surrounds. It proposes a biosphere reserve-type approach for the area, incorporating a small core conservation area surrounding the mouth of the estuary, a transition zone surrounding the Olifantsdrif settlement, and the remainder of the study area being proposed as buffer zone.

There is currently little development and use of the estuary margins, though there has been some loss of saltmarsh. Nevertheless, applications for development around the estuary margins have been made and are likely to increase in the future, bringing associated challenges for managing use of the estuary. Recreational use is relatively low except during the peak holidays season when informal camping takes place on the salt marsh area adjacent to Papendorp, but will probably increase, and will need to be managed to limit disturbance. Key concerns are light aircraft, quad bikes, and speedboats, which cause disturbance to habitats and fauna.

The area falls within a strip of diamond mining concessions along the west coast, with offshore and terrestrial concessions straddling the estuary mouth area. These have been mined in the past and are not active at present. Any activity would have to be preceded by an environmental impact assessment and would require an environmental management plan. The salt pan has no significant impact on the estuary at the present time. However, reclaiming the salt pan as an artisanal enterprise is supported by estuary stakeholders. Of greater concern currently are exploratory prospecting and mining licence applications underway on the west bank of the estuary with the intention of mining mineral sands. The proposed mining area would overlap with large areas designated as Critical Biodiversity Area (CBA) in the Western Cape Biodiversity Framework and Matzikama SDF.

The Olifants River Estuary has also been identified as one in which there is a need for rehabilitation. In the case of the Olifants River Estuary, restoration of the estuary to a better state of health would be very straightforward, and would mainly entail (in order of priority):

1. Promote sustainable fishing practices and if required reduce fishing pressure on the estuary;
2. Restoration of the quantity of freshwater inflows;
3. Restoration of water quality; and
4. Removing the barrier effect of the Lutzville causeway.

In general, the degree to which these factors should be managed to restore the health of the system depends largely on the vision that is developed for the estuary, and on its future protection status.

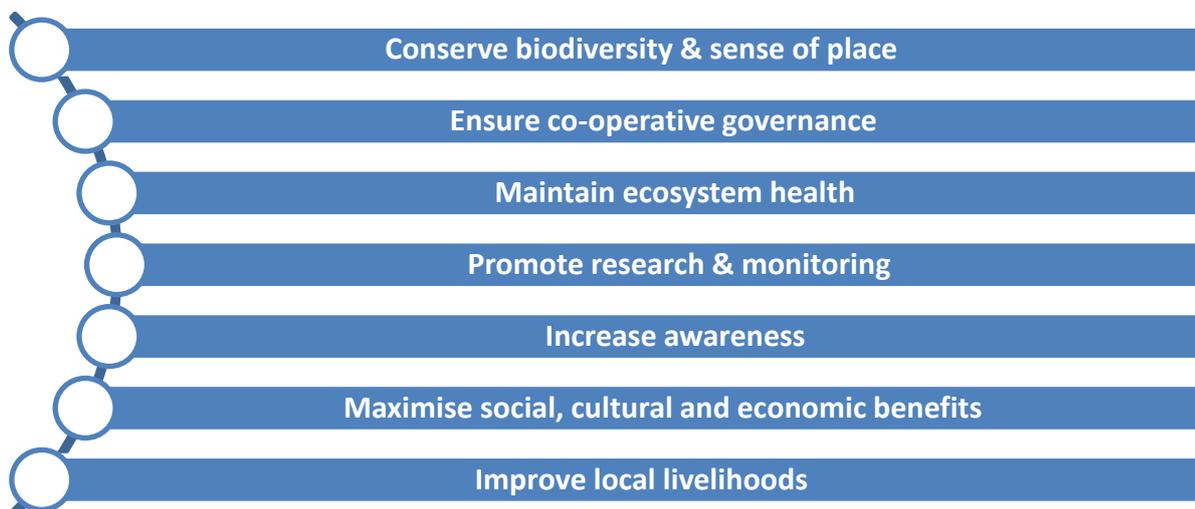
Vision and Objectives

A vision is a high level statement which defines the strategic intent of a management intervention. A draft vision was developed in the initial stages of the stakeholder consultation process. This vision was revised at a meeting of Olifants River Estuary stakeholders on 6 June 2011 (Minutes of the Estuary Interim Forum Meeting 6 June 2011) and has been further

refined at a meeting held in Cape Town with representatives of the fisher community, University of Cape Town and Masifundise Development Trust in November 2013.

The Olifants River Estuary is critically important for people and wildlife; it should bring economic benefits to the local community through sustainable use of natural resources and responsible ecotourism; it should protect the cultural heritage and practices of the local community and should benefit all South Africans through conservation of biodiversity and ecosystem functions.

Key management objectives for the Olifants River estuary were identified and agreed upon at stakeholder workshops held in 2008. These objectives are seen to reinforce all other objectives and none are seen as being of greater importance than any other.



Spatial Zonation

While it is recommended that no development be allowed on the west bank, limited development nodes should be identified on the east bank which take account of development proposals in the Community Development Land Acquisition Plan and provide development for existing communities without compromising livelihoods, cultural heritage and sense of place, and provide low density ecotourism opportunities. No development should take place within the 1:100yr flood line. Any proposals should be taken into account in the management line determination process. The provincial authority should be required to engage with landowners, the land claimant community and their relevant structures as well as members of the Estuary Advisory Forum.

In addition to adopting the extent of the Coastal Protection Zone and delineating the coastal management line around the Olifants River Estuary, it has been proposed that a portion of the lower estuary, at the mouth of the estuary be demarcated as a **form of protected area or community conservation area**.

This protected area would be zoned as a **no-take fishing area** and would restrict certain activities and use of mechanised vessels. Zonation will allow for partitioning of activities within the estuary, thus permitting their co-existence without one activity precluding or conflicting with another. However, the traditional fishing activities of the local communities will need to be considered in this zonation process. **This zonation plan will need to align with the fisheries management plan that will be prepared in terms of the new Small-scale Fishing Policy.** Such a zonation plan will also reduce management costs as it will focus activities in particular geographic areas and hence eliminate the need to deploy management staff across the whole estuary at all times.

The proposed protected area extends from the mouth up to one km upstream and ideally would include the banks of the estuary where sensitive and conservation worthy estuarine vegetation occurs (Figure 6). It is proposed that this protected areas includes the area that extends from the mouth one kilometre upstream and from the middle of the estuary channel up to the top of the supratidal salt marsh on the west bank of the estuary. This area is proposed a bait (invertebrate) and water bird sanctuary.

Restricting the use of petrol or diesel boat engines to management and research use only, which has long been a tradition on this estuary, will also minimise disturbance to wildlife and the wilderness atmosphere on the system without overly restricting ability of visitors to enjoy the benefits thereof. The SAMSA regulations pertaining to the traditional vessels will need to be evaluated. It may be necessary, though, to provide exemptions for certain uses, provided these are kept to a minimum and are properly motivated (e.g. management and enforcement, tourism operators).

Aquaculture is not catered for within the zonation plan as the fluctuating salinities and high nutrient content of the system render it unsuitable for any aquaculture ventures. Land-based aquaculture could thus be considered in preference to in-stream aquaculture. However, the development of such an industry would need consultation with and approval by stakeholders.

An inclusive, consultative process of developing a zonation plan, indicating the protected area, and activities appropriate in different zones, needs to be undertaken.

Institutional Arrangements

As per the Protocol CapeNature, or its assigned representative is identified, as the Responsible Management Authority responsible for the development of the Olifants River EMP as well as being responsible for the co-ordination of its implementation. **The Governance Tool developed by CapeNature will be used to identify, monitor, and track the implementation of management objectives.**

According to the Protocol, the role of the existing Olifants River Estuary Advisory Forum is interpreted as providing an advisory service to the Responsible Management Authority on issues specific to the management and implementation of the Estuarine Management Plan, as well as being the hub that links all stakeholders, which serves to foster stakeholder engagement and to facilitate the implementation of the project plans identified. The broader community will be able to voice concerns and raise issues via the OEAF. This

includes the CPA, Ratepayers' Associations, NGO's, community groups, conservancies, etc., as well as representatives from surrounding industry and agriculture. Any representatives are obliged to raise issues identified by their constituents and to provide feedback to the constituents. Importantly, the Forum will not represent or supplant the individual positions of its members unless specifically mandated to do so.

The successful implementation of the Estuarine Management Plan may be seen as also dependent on the contribution of a number of governmental role players, including:

- Western Cape Government departments: Responsible for legislative support, including compliance, funding, research and monitoring;
- Matzikama Municipality and West Coast District Municipality: Responsible for legislative support and funding;
- Relevant National government departments, especially Department of Environmental Affairs, Department of Water and Sanitation (via the regional office), Department of Environment, Forestry and Fisheries, Department of Agriculture Land Reform and Rural Development
- Organs of State (SANparks, CapeNature, Berg-Olifants CMA).

The National Department of Environmental Affairs is generally responsible for national standardisation of estuarine management and approval of provincially-compiled estuarine management plans. Direct involvement in individual estuaries, such as the Olifants, will occur via existing forums for intergovernmental coordination. These forums will have the management of the Olifants River estuary on their agendas from time to time, and include:

- **Western Cape Provincial Coastal Committee:** Responsible for facilitating co-management, effective governance and provincial co-ordination of estuarine management
- **West Coast District Municipal Coastal Committee:** Responsible for facilitating co-management and effective governance.

Management Priorities

Seven project plans have been compiled for the efficient and effective management of the Olifants River Estuary. Each plan corresponds to a key objective and contains applicable management actions, supporting regulations, level of priority, responsible institution(s), and required resources if such information is available. These are arranged in general order of priority, but nevertheless recognize that the neglect of any leg will compromise overall success:

- Conserve biodiversity
- Improve local livelihoods
- Maintain ecosystem health
- Ensure local community involvement
- Maintain sense of place
- Increase awareness
- Maximise social, cultural and economic benefits

It should be noted that there is some interconnectedness between the plans and some management actions, as they all ultimately contribute to the conservation of ecosystem function and patterns of biodiversity, which in turn leads to the conservation of a sustained supply of ecosystem goods and services delivered by the estuary.

The table below provides a summary of the Management Objectives per priority area as part of the Performance Monitoring Plan:

MANAGEMENT OBJECTIVES	PERFORMANCE INDICATOR	TIMING	LEGISLATION	RESPONSIBILITY
1. Protection of biodiversity and sense of place				
a. Establish a Special Management Area (SMA)	Lower Olifants River Estuary receives formal protection as SMA	Once a year	ICM Act NEM:PAA	CapeNature, OEAF, DEA
b. Facilitate the establishment of a functional co-management committee for estuarine resources	Co management committee established and minutes of meetings	Assess twice a year	MLRA	RMA, DFFE, DEA, OEAF
c. Integrate into IDP/SDF	OEMP is reflected in the local/district IDP and SDF, and coastal management line is gazetted	Every IDP/SDF review cycle	ICM Act, MSA	Matzikama LM, RMA
d. Regulate boat traffic	Boating and other estuary used occur only within designated areas	Every 5 years	ICM Act, MSA, Seashore Act	Matzikama LM, WCDM, RMA
2. Co-operative and effective governance				
a. Appoint Olifants River Estuary Advisory Forum	Confirmed members and constituted OEAF	End of 1st year	ICM Act	CapeNature.
b. Define co-operative governance arrangements	Confirmed roles & responsibilities of participating agencies	Assess every 2 years	ICM Act, NEM:PAA	RMA, OEAF, Matzikama LM, DFFE, DWS
c. Secure financing	Funding is secured for next 5 years	Assess twice a year	ICM Act, NWA, CARA, MSA	CapeNature, Matzikama LM, DEA&DP, Key partners
d. Provide resources and capacity	Office space obtained and adequately equipped, manned by knowledgeable and well-trained permanent staff	Assess twice a year		CapeNature, Matzikama LM, DEA&DP, Key partners
3. Restoration of estuary health				
a. Secure freshwater input	Ecological health category B is achieved	Biannual for DWS	NWA	DWS, Matzikama LM, OEAF, CapeNature
b. Lobby to rehabilitate mined habitat	Degraded habitat rehabilitated. Improvement in ecological health indices.	Ad hoc visual monitoring during normal daily activities	MPRDA	CapeNature, Matzikama LM,

MANAGEMENT OBJECTIVES	PERFORMANCE INDICATOR	TIMING	LEGISLATION	RESPONSIBILITY
c. Reduce disturbance to the estuarine functional zone	Retreat & prevention of detrimental mining activities Improvement in ecological health indices.	Once a year	MPRDA	CapeNature, Matzikama LM, DEA, DMR
4. Research and monitoring				
a. Promote scientific research incorporating local knowledge	Increase in number of research projects and monitoring programmes	Once a year		Matzikama LM, OEAF, CapeNature
b. Monitor estuary health	On-going databases and reports produced	Biannual for DWS Monthly for OEAF	NWA	Matzikama LM, DWS, OEAF, CapeNature
c. Monitor human use and socio-economic conditions	On-going databases and reports produced	Ad hoc visual monitoring during normal daily activities	MLRA	Matzikama LM, OEAF, CapeNature
5. Increasing public awareness				
a. Create mechanisms for communication with stakeholders	Widespread and effective communication to a diversity of stakeholders who are well informed through their preferred method of communication	Once a year	ICM Act	CapeNature, Matzikama LM, OEAF
b. Develop education and awareness programme	Visitor centre open to public Increase in number of newsletters, pamphlets, posters Sufficient number of public notice boards	Once a year	ICM Act	CapeNature, Matzikama LM, OEAF
6. Promoting ecotourism				
a. Establish and manage visitor facilities	Increase in number of tourists per year Increase in tourism-related development and businesses/enterprises			CapeNature, Matzikama LM, OEAF
b. Market the Olifants River Estuary	Increase in number of newsletters, pamphlets, and posters Increase in number of tourists per year			CapeNature, Matzikama LM, OEAF
7. Enhancing local livelihoods				
a. Sustainable use of estuary resources	Integrated Fisheries Management Plan developed Set number of permits issued to local community Feasibility of mariculture operation determined		MLRA	DEFF DEA: OC Matzikama LM CapeNature
b. Provide supplementary	Increase in number of employed persons			Matzikama LM, CapeNature

UITVOERENDE OPSOMMING

MANAGEMENT OBJECTIVES	PERFORMANCE INDICATOR	TIMING	LEGISLATION	RESPONSIBILITY
livelihoods	On-going provision of employment opportunities			DEA: Alternative livelihoods

Inleiding

Riviermondings word erken as baie sensitiewe en dinamiese ekosisteme, en benodig daarom bogemiddelde sorg in die beplanning en beheer van aktiwiteite wat verband hou met die gebruik en bestuur daarvan. Om hierdie rede vereis die Wet op Nasionale Omgewingsbestuur: Geïntegreerde Kusbestuur (No. 24 van 2008, soos gewysig deur Wet 36 van 2014) (ICM-wet), via die voorskrifte van die Nasionale Bestuursprotokol (die Protokol) dat riviermondbestuurplanne voorberei moet word vir riviermondings ten einde ingeligte platforms te skep vir doeltreffende en gekoördineerde riviermondingsbestuur.

Die riviermonding van Olifantsrivier is een van 279 funksionele riviermondings in Suid-Afrika (Turpie 2004) en een van vier riviermondings wat permanent oop is aan die weskus (Whitfield 2000). Dit is die 12de grootste riviermonding in die land, met 'n totale oppervlakte van 702 ha. Die riviermonding is een van die belangrikste in die land in terme van sy bewaringswaarde vanuit 'n ekologiese, sosiale en kulturele erfenisperspektief. Die riviermonding en die omliggende landskap vorm die basis van die kultuur en lewensbestaan van die plaaslike Ebenhaeser-gemeenskap vir etlike eeue. Benewens die sosiokulturele en erfenisbelang daarvan, bied die riviermond kritieke ekosisteemgoedere en -dienste. Die riviermonding is ook opmerklik in die sin dat dit een van die minste ontwikkelde van die groot permanent oop riviermondings in Suid-Afrika is, wat 'n waardevolle heiligdom bied vir flora en fauna sowel as vir besoekers.

Hierdie dokument is 'n bestuursplan vir die riviermonding van Olifantsrivier en moet saamgelees word met die situasie-assesseringsverslag wat die agtergrondmateriaal vorm vir die ontwikkeling van die bestuursplan. Anchor Environmental Consultants cc het die taak gehad om die destydse aanvanklike plan op te stel onder die beskerming van die Kaapse aksieplan vir die omgewing se streeksbestuursprogram vir riviermondings. Die hoofdoel van die program is om 'n bewaringsplan vir die riviermondings van die Kaapse Floristiese Streek te ontwikkel, en om strategiese bestuursplanne vir elke riviermonding op te stel.

Situasiebeoordeling

Die riviermonding van die Olifantsrivier is een van die grootste van Suid-Afrika se 279 riviermondings, met 'n totale oppervlakte van 702 ha tipiese riviermondingshabitat plus 797

ha vloedvlakte soutmoeras, wat saam 1499 ha beslaan. Dit is een van die belangrikste riviermondings in die land vanuit 'n bewaringsperspektief. Die riviermonding is ook opmerklik in die sin dat dit miskien die minste ontwikkel is van die groot permanent oop riviermondings in Suid-Afrika, wat 'n waardevolle heiligdom vir flora en fauna en besoekers bied. Die toenemende druk kan hierdie waarde egter verminder, aangesien die onttrekking van water en besoedeling die toestand van die riviermond aantast. Die visvoorraad word ook beïnvloed deur kleinskaalse hengel, en die vraag na ontwikkeling verder op aan die Weskus. Nietemin is daar steeds goeie geleentheid vir proaktiewe beplanning om 'n visie vir die riviermonding te vorm en 'n bestuurstrategie in plek te stel wat die visie sal bereik.

Die Olifants-riviermonding lê 250 km noord van Kaapstad aan die Weskus en vorm die monding van die Olifants-Doringrivierstelsel. Die Olifants-Doring-opvanggebied loop oor die Noord- en Wes-Kaap, en die riviermonding is geleë in die Matzikamma plaaslike munisipaliteit, in die Weskus-distriksmunisipaliteit in die Wes-Kaap. Die riviermonding strek vanaf sy permanent oop mond ($31^{\circ} 42'S$; $18^{\circ} 11.34'E$), ongeveer 36 km stroomop tot by die laagwaterbrug naby Lutzville ($31^{\circ} 33.8'S$; $18^{\circ} 19.78'E$). Die kanaal wissel van 550 m breed net stroomop van die mond tot 20 m aan die kop van die riviermonding. Diepte is meestal 2-3 m. Die laterale omvang van die riviermonding word gedefinieer deur die limiet van riviermondingsplantegroei, insluitend vloedvlakte soutmoeras.

Die riviermonding dreineer een van die grootste opvanggebiede in die land. Reënval in die opvanggebied wissel van 1500 mm in die suide tot 300 mm in die noorde. Die gebied is grotendeels droog, oorheers deur sukkulente Karoo-plantegroei, sowel as fynbosplantegroei in die suide en Nama Karoo-plantegroei in die noorde. Die winterreënval in die suide is die oorheersende bron van vloei na die riviermonding via die Olifantsrivier, terwyl die Doringrivier, sy belangrikste sytak, afwisselend droog is. Die Doringrivier is meer soutoplossend en bevat meer gesuspendeerde vaste stowwe as die Olifantsrivier weens verskille in opvanggrond. Die vloei word gereguleer deur die Clanwilliam- en Bulshoekdamme aan die Olifantsrivier en daar was 'n voorstel om die kapasiteit van die Clanwilliamdam te vergroot.

Ongeveer 90% van die opvangsgebied is nie getransformeer nie, waarvan baie in natuurreservate en die res vir vee gebruik word. Daar is 'n bietjie droëlandboerdery (bv. Rooibostee) en beduidende besproeiing langs die Olifantsrivier (bv. Sitrus, duiwe). Daar is ook ontginning van gips, sout, sand, minerale sand en diamante in die omgewing. Landbou is die ruggraat van die ekonomie van die gebied, alhoewel toerisme ook van groter belang is.

Dit is die yl bevolkste opvangsgebied in die land, met die meeste van die bevolking wat in die Koue Bokkeveld en Olifantsriviervallei woon. Die bevolking is oorwegend bruin (70%) en wit (20%), en meer as 90% van die mense is Afrikaanssprekend. Die meerderheid is arm, maar indiensnemingsvlakke en dienste is redelik in vergelyking met die res van Suid-Afrika. 'n Groot deel van die land rondom die riviermonding is gemeenskaplike grond wat aan die Ebenhaeser-gemeenskap behoort.

Die mense van Ebenhaeser en Papendorp het 'n lang geskiedenis van visvang in die riviermonding Olifantsrivier. Hierdie gemeenskappe was afstammelingen van inheemse Khoi-

San-groepe wat hulle ongeveer in die 17de eeu in die Olifantsriviervallei gevestig het (Parkington, 1977). Die realiteite van hierdie vissersgemeenskap vandag is gewortel in die geskiedenis van 'n landwisseling wat in 1927 plaasgevind het toe die koloniale regering aan die Kaap hierdie gemeenskap met geweld hervestig het op onvrugbare grond naby die monding van die Olifantsrivier om landbougeleenthede te bied aan arm blankes. As gevolg van die swak gehalte grond en die gebrek aan water by die hervestigingsgebiede, het baie mense toenemend van die visvang as hoofbron van voedsel en lewensbestaan afhanklik geraak (Sowman, 2009).

Die historiese rekord skets 'n prentjie van 'n gemarginaliseerde gemeenskap, hoofsaaklik afhanklik van plaaslike hulpbronne vir voedsel en lewensbestaan met min hulp van die regering (LRC, 2003). Tans is daar ongeveer 1200 huishoudings in die Ebenhaeser en Papendorp nedersettings, waarvan ongeveer 120 betrokke is by visvang as 'n voedselbron of 'n bydrae tot hul lewensbestaan (Williams, 2013; EcoAfrica, 2012). Dit is 'n arm gemeenskap met 'n hoë vlak van werkloosheid (ongeveer 26%) en relatief lae vlakke van opleiding (EcoAfrica, 2013). Diegene wat nie aan visvang deelneem nie, is betrokke by kleinskaalse landbou, ad hoc-werk op aangrensende kommersiële plase of hulle kry korttermyn-werk by openbare werke en projekte vir die verligting van armoede. Baie inwoners is afhanklik van maatskaplike toelaes van die regering om in hul basiese vereistes te voorsien (Williams, 2013).

Daar is tans 45 perмите uitgereik vir kiefnet vissery. Volgens die huidige permitvoorwaardes kan 90 vissers te eniger tyd op die riviermonding visvang. In die praktyk is daar egter gereeld minder vissers op die riviermonding, en die getalle neem af weens onbetroubare vangste, en namate meer vissers betrokke raak by visvang op see.

Die mond van die riviermonding is permanent oop. Die Lutzville-brug is 'n teken van die omvang van fluktuasies in die watervlak. Die gemiddelde afloopwater wat die riviermonding bereik, wissel met ongeveer 715 Mm³ / jaar, ongeveer 33% minder as in die natuurlike toestand. Beide lae vloei en wintervloedpieke is verminder, wat die inset van sediment in die riviermonding verminder. Dit word vermoed dat dit die kanaal verdiep het, sodat dit getypenetrasie verder stroomop moontlik gemaak het. Anders as onder natuurlike omstandighede, toe dit skaars was, laat dit die riviermonding toe om ongeveer ses maande van die jaar (November tot April) 'n mariene oorheersende toestand beleef, en sodoende vervang dit 'n situasie waar soutwater slegs tot die middelvlak uitbrei. In die winter heers 'n toestand wat deur varswater gedomineer word. Huidige waarnemings deur plaaslike vissers dui egter op 'n bewys van die uitbreiding van sandoewers om die riviermonding. Dit kan die gevolg wees van 'n verminderde riviervloei wat nie die mondgebied uitspoel nie.

Soutverspreiding in die riviermond beïnvloed die verspreiding en oorfloed van plante en diere. Mariene oorheersing in die somer beteken dat soutgehalte ver in die riviermonding binnedring met 'n lesing van 5ppt ongeveer 20 km stroomop regoor die waterkolom. In die winter vloei varswater bo-oor die soutwater, en laasgenoemde dring net 'n entjie stroomop. Die riviermonding is warmer in die somer as in die winter en het laer suurstofkonsentrasies in die somer. Suurstof word in dieper, stadiger bewegende water uitgeput, veral in die middel van die riviermonding in die somer. Waterhelderheid word beïnvloed deur die relatiewe

inset van die Olifantsrivieropvanggebied (helder), Doringrivieropvanggebied (troebel) en die see (helder). Die riviermonding is helderder in die somer as in die winter.

Voedingstowwe (bv. stikstof, fosfor, silika) kom in die riviermonding in die see (veral tydens die opwelling) en rivierwater (veral na die eerste reënval) voor, maar die bydrae deur rivierwater het die afgelope dekades geweldig toegeneem as gevolg van landboupraktyke, wat gelei het tot die groei van onkruid in die riviermonding.

Mikroalge vorm die onderkant van die voedselketting en bestaan uit die fitoplankton in die waterkolom en die bentiese mikroalge aan die onderkant. Die fitoplankton word oorheers deur flagellate in riviergedomineerde gebiede en diatome in marien gedomineerde gebiede, en die oorfloed daarvan word beïnvloed deur die konsentrasies van voedingstowwe. Min is bekend oor die bentiese mikroalge, maar die oorfloed daarvan in die winter weerspieël die hoë voedingstofbelasting van die stelsel.

Plantegroei van die riviermonding kan in vier soorte gemeenskappe verdeel word:

1) Makroalge sluit die seewier by die mond in, sowel as spesies wat dui op verryking van voedingstowwe naby die punt van die riviermonding. Laasgenoemde sluit in *Enteromorpha*, wat op bootpropellers en -pompe groei en die matvormende, drywende makrofiet, bekend as eendewier, wat in die boonste gebied volop is;

2) Ondergedompelde makrofiete bestaan uit damweë, wat digte beddings in die boonste vlakke vorm en wat toegeneem het as gevolg van voedingsverryking, en palinggras, wat in die onderste bereik groei, wat 'n belangrike habitat vir jong visse bied;

3) Riete en rante is belangrik vir funksie en diversiteit, maar verdra nie die hoë soutgehalte nie en het stroomaf teruggesak as gevolg van die vermindering in varswaterinvoer; en

4) Soutmoeras kom hoofsaaklik in oop riviermondings voor, en die riviermonding van die Olifantsrivier bevat 'n groot deel van hierdie habitat in Suid-Afrika. Dit dra by tot die stelselproduktiwiteit en biotiese diversiteit en bied habitat en skuiling vir talle ongewerweldes en voëlsesies. Die soutmoerasse van die riviermonding in die Olifantsrivier is ook redelik ongewoon, met die soutmoeras op die vloedvlakte wat in die verlede as 'n oorblyfsel van 'n groter stelsel beskou is. Ondanks weiding en 'n bietjie opruiming, was die versteuring van soutmoeras maar gering.

Die ongewerwelde gemeenskap bestaan uit zooplankton en die bentiese gemeenskappe in en op die sedimente. Die ongewerwelde gemeenskappe in die riviermonding van die Olifantsrivier word gekenmerk deur 'n groot hoeveelheid relatief tot ander riviermondings in Suid-Afrika, en 'n hoë spesierikheid aan die weskus, waar diversiteit gewoonlik redelik laag is. Die dominante ongewerwelde spesies is *Pseudodiaptomus hessei* (zooplankton), die amfipode *Melita zeylanica*, die kroonkrab *Hymenosoma orbiculare* (hyperbenthos), die polychaetes *Ceratonereis keiskamma*, *Desdemona ornata* en die amphipods *Corophium triaenonyxica* (Melidia), *Grandidierella lutosa* en *Melita zeylanica* (benthos). Die hoeveelheid zooplankton en hiperbenthos is die grootste in die middel van die

riviermonding, en die hiperbenthos is die hoogste aan die bokant van die riviermonding. Hierdie ongewerweldes is belangrik vir die voeding van visse en voëls.

Altesaam 38 visspesies uit 30 families is in die Olifantsriviermonding aangeteken, waarvan 18 gedeeltelik of volledig afhanklik is van die riviermonding vir hul oorlewing. Dit sluit 'n aantal waardevolle spesies in, soos wit steenbras en harders. Die riviermondings aan die weskus is van kardinale belang om die omvang en voorraadintegriteit van riviermondings- en riviermondingsafhanklike spesies langs die hele weskus te handhaaf, en die riviermonding van Olifantsrivier is 'n belangrike kweekdam. Die afname in die harder vangste en die mariene kiefnet vangste aan die weskus word toegeskryf aan oormatige visvang in die kiefnetvisserie in die Berg- en Olifantsriviermondings (Hutchings & Lamberth 2003). Werk deur Rice (2015) dui daarop dat druk op lynvisspesies wat in die Olifantsriviermonding aangetref word deur ander visserie soos treilvisserie en kommersiële lynvisserie aansienlik bydra tot die status van hierdie voorrade.

Dit is waarskynlik dat daar 'n beduidende verandering in die visfauna in vergelyking met die natuurlike toestande plaasgevind het, met 'n afname in die diversiteit en visgroottes as gevolg van die verandering in varswaterstrome en visvang. Harder en riviermondingharing is nou die dominante visspesie in die riviermonding, en die elf vorm ook 'n beduidende deel van die visgetal. Die meerderheid van die riviermondingsafhanklike spesies kom die meeste voor tussen 5-20 km van die mond, in soute van 0-20 ppt en waterhelderheid minder as 100 cm. Daar moet egter voldoende bestuur op die riviermonding toegepas word om die voortbestaan van hierdie spesies te verseker, aangesien hulle baie beweeglik is vanaf die mond tot by die bopunt van die riviermonding.

Voëls is waarskynlik een van die belangrikste komponente van die riviermonding se biodiversiteit. Vanweë die grootte en diversiteit van habitatte op die riviermonding en die gebrek aan steuring, is daar 'n groot diversiteit van voëlspesies. Sowat 72 watervoëlspesies kom voor op die riviermond (swerwende besoekers word nie ingesluit nie), waarvan 21 langafstandtrekkers is wat meestal die somer op die riviermond deurbring. Voëlgetalle neem toe van gemiddeld 3200 in die winter tot 5900 in die somer, hoewel daar soms baie hoër getalle aangeteken is. Die gebied naby die mond ondersteun ongeveer 80% van die voëls van die riviermonding (afgesien van die mariene kormorante by die rotse), en 90% word binne 9 km van die mond gevind. Verskillende spesies is kenmerkend van verskillende habitatte. Intergety habitatte ondersteun die hoogste digtheid. Baie min voëls kom voor in die soutpan en supergety moerasse, maar die samestelling van die gemeenskap is duidelik. Die sandoewers in die onderste riviermonding is belangrike rusareas vir sterretjie vinke en meeu. Die boonste oewers is die tuiste van watervoëls wat geneig is om vars of brak habitatte te verkies. Afgesien van die mariene kormorante, bestaan die voëls op die riviermonding uit voëls wat ongewerwelde diere eet (meestal waadvoëls), visvinkies (meestal sterretjies), herbivore (watervoëls) en algemene voeders (meeue), met die eerste twee groepe wat in die somer oorheersend is. Die voëlgemeenskap reageer baie op verandering wat nat en droë jare op die riviermonding weerspieël.

Riviermondings kan 'n reeks dienste lewer wat ekonomiese of welsynswaarde het. In die geval van die riviermonding van die Olifantsrivier is die kleinskaalse visserie, die ontspanningswaarde en die kwekerywaarde van die riviermonding die belangrikste. Daar

kan addisionele waardes wees, soos koolstofsekwestrasie, maar dit word nie goed verstaan nie en is waarskynlik redelik gering.

Die riviermonding is opvallend teen die droë agtergrond en bied met hul visvang- en voëlkykgeleenthede 'n ontspanningservaring van hoë gehalte. Anders as die meeste groot riviermondings in Suid-Afrika, is daar geen groot stedelike nedersetting rondom die monding van die Olifantsrivier nie, hoewel Strandfontein-dorpie naby is, en besoekers kamp tans informeel langs die riviermonding by Papendorp. Hierdie informele kampeerterrrein skep beduidende probleme gedurende die Kers- / Nuwejaar- en Paasvakansietye weens die gebrek aan dienste en infrastruktuur en die skade aan sensitiewe plantegroei wat deur voertuie en kampeerders veroorsaak word. Die grootste deel van die Olifantsriviervangste word binne 500 m van die mond af gemaak en bestaan uit silwer kabeljou (ineengestort), wit steenbras (ineengestort), steenbras aan die Weskus (optimaal benut) en elf (te veel uit gebuit). Die status van hierdie voorrade is aanduidend van die algemene afname van vis voorrade in die land. Hengelaars bestee aansienlike bedrae aan hierdie aktiwiteit, grootliks ongeag hul vangsobbrengste. Alhoewel dit klein is, is die ontspanningsvisserie op die Olifantsrivier waarskynlik R0,6 - R1,3 miljoen per jaar werd. Die kommer oor die impak van die ontspanningsvisvang op die eenmalige visbestand en die inmenging daarvan met die kleinskaalse visserie het daartoe gelei tot groter beperkings op hengelaars.

Riviermondings bevat varswater-, land- en mariene komponente, en word sterk beïnvloed deur aktiwiteite in 'n baie groter opvanggebied en aangrensende mariene gebied, en word beïnvloed deur 'n groot aantal beleide en wette. Die Wet op Geïntegreerde Kusbestuur van 2008 (gewysig 2014) vereis dat 'n bestuursplan opgestel word vir elke riviermonding volgens 'n nasionale protokol. Die Nasionale Riviermondingsprotokol, wat in 2013 gepromulgeer is, bied die nasionale beleid vir riviermondingsbestuur en lei die ontwikkeling van individuele planne vir riviermondingsbestuur. Dit stipuleer die minimum vereistes vir die inhoud van 'n riviermondingsbestuursplan, en skryf die prosedures voor wat gevolg moet word by die ontwikkeling van 'n bestuursplan en enige moontlike institusionele reëlings. Wat belangrik is, is dat die protokol duidelikheid gee oor watter owerhede verantwoordelik is vir die ontwikkeling, koördinerie en implementering van die plan. Aangesien die riviermonding in die Olifantsrivier voorkeur kry ten opsigte van bewaring en deel vorm van die Wes Kaapse Beskermdede Area Uitbreidingsstrategie is die aangewese owerheid vir bestuur die provinsiale bewarings agentskap: CapeNature. Die protokol bepaal dat die verantwoordelike bestuursowerheid dienooreenkomstig moet begroot vir die ontwikkeling van hierdie planne.

Op nasionale vlak val riviermondingsbestuur hoofsaaklik onder twee nasionale regeringsdepartemente: die Departement van Waterwese, wat verantwoordelik is vir waterbronne, en die Departement vir Omgewingsake, wat verantwoordelik is vir alles anders, bv. grondgebruik, lewensbronne. Omgewingsbestuur word in die meeste gevalle tot op provinsiale vlak toegepas. Die bestuur en bewaring van mariene lewende hulpbronne is 'n uitsondering in hierdie opsig, met die verantwoordelikheid vir kwessies rakende kus- en riviermondingsbestuur by die Direkoraat Oseane en Kus van die Departement Omgewingsake en bestuur van mariene hulpbronne by die Departement Bosbou en Visserye. Op munisipale vlak word daar verordeninge aanvaar wat nie met provinsiale en nasionale wette kan bots nie.

Waterkwaliteit en -hoeveelheid word hoofsaaklik onder die Nasionale Waterwet 36 van 1998 beheer. Dit maak voorsiening vir 'n omgewingsreserwe wat die hoeveelheid en kwaliteit van die watervloei benodig om die natuurlike werking van elke waterbron, insluitend riviermondings, te beskerm. Die mate waarin voorsiening gemaak word vir die funksionering van 'n riviermonding word bepaal deur die aangewese toekomstige bestuursklas (waar klasse A - F die gezondheidstoestand beskryf), genaamd die Ekologiese Reserwekategorie. Die reservaat is bepaal op grond van aanbevelings wat gemaak is uit 'n reserwebepalingstudie ("hulpbrongerigte maatreëls") en sosio-ekonomiese oorwegings. Hierdie studie is voltooi in die riviermonding in Olifantsrivier in 2006. Die studie het bepaal dat die riviermonding 'n riviermonding in die C-klas was ("matig verander"). Implikasies van verskillende moontlike toekomstige vloeiesscenario's is bepaal, en op grond hiervan en die nasionale belang van die riviermonding, is die aanbeveling gemaak om voldoende vloei te verskaf (dit wil sê die herstel van sommige strome) om die riviermonding na 'n B-klas te bring ("grotendeels natuurlike"). Spesifikasies vir waterkwaliteit is ook aanbeveel, gebaseer op die instandhouding van 'n B-klas-kategorie, wat beteken dat maatreëls getref word om die insette van organiese en anorganiese besoedelingstowwe in die rivier en riviermonding te beheer. 'n Finale besluit oor die kategorie vir ekologiese reservate moet nog deur Departement van Waterwese geneem word.

Die benutting van lewende hulpbronne in die riviermonding word beheer deur die Wet op Lewende Mariene Hulpbronne (1998) en die wysigings daarvan, sowel as die onlangs gepromulgeerde Kleinskaalse Visserye-beleid (KVB) (DBV, 2012) en gepaardgaande regulasies (DBV, 2016). Hoofdoelstellings van die Wet op Lewende Mariene Hulpbronne (Wet 18 van 1998, soos gewysig) (MLRA) en KVB-beleid, sluit in volhoubare gebruik van hulpbronne, die bevordering van die beskerming van die ekostelsel en biodiversiteit, die gebruik van mariene hulpbronne vir sosio-ekonomiese ontwikkeling en die verligting van armoede sowel as transformasie van die vissersektor. Die nuwe KVB erken die regte en sosio-ekonomiese behoeftes van kleinskaalse visserye en gee respek en wetlike beskerming. Van besondere belang is die vereiste dat hierdie kleinskaalse vissers voorkeursoegang tot mariene bronne kry, veral waar sulke gemeenskappe histories van sulke hulpbronne afhanklik was.

Ingevolge die Seekus Wet van 1935 behoort die riviermonding tot by die hoogwatermerk aan die staat. Ingevolge die ICM-wet moet die Minister die grense van openbare eiendom aan die kus bepaal om die toegang van die publiek tot die strand te verbeter; sensitiewe kus-ekosisteme te beskerm; en die natuurlike funksionering van dinamiese kusprosesse te beveilig om mense, eiendom en ekonomiese aktiwiteite teen risiko's te beskerm (afdeling 7A). Verder bied die ICM-wet leiding oor die volhoubare gebruik, ontwikkeling en beskerming van die kussone. Die ICM-wet maak voorsiening vir die bepaling van 'n kusbeskermingsone (CPZ) op kusgrond en aangrensend aan die Hoogwatermerk (HWM) en strek 1 km van die hoogwatermerk (ook in riviermondings) vir onontwikkelde grond en grond wat vir landbou gesoneer is gebruik, wat verminder word tot 100 m in gebiede wat gesoneer is vir ander 'stedelike' grondgebruike (bv. residensiële, industriële of kommersiële). In die geval van die Olifantsrivier val alle grond rondom die riviermonding in die voormalige kategorieë, en ingevolge die ICM-wet, sou 'n standaard CPZ van 1 km rondom die hele riviermonding geld. Die grense van hierdie gebied kan egter deur die LUR en in die Wes-Kaap aangepas word; die topografiese kontoer van 10 m is die voorgestelde maksimum

breedte van die CPZ rondom riviermondings, volgens die *West Coast District Backbacks Project*. Binne die CPZ mag geen nuwe landtransformasie of -ontwikkeling plaasvind sonder magtiging uitgereik deur die verantwoordelike owerheid (LUR of Minister nie, afhangend van die aard van die aktiwiteit). Daar is ook voorsiening om, waar nodig, 'n groter CPZ ingevolge die ICM-wet te skep. Let egter daarop dat 'n vrystelling gegee is aan grondeienaars ten opsigte van grondonteiening op die grond onder die besproeiingskanaal en sekere ander gebiede aangrensend aan die Olifantsriviermonding ingevolge die Wet op die Bewaring van Landbouhulpbronne (Wet No. 43 van 1983) (CARA) en die Wet op Nasionale Omgewingsbestuur (Wet No. 107 van 1998) (NEMA). Dit is waarskynlik dat hierdie vrystelling ook van toepassing sal wees op die ICM-wet, maar net op grondvrystelling vir die landbou. Dit moet bevestig word.

Die Wet op Munisipale Stelsels (Wet No. 32 van 2000) (MSA) vereis die identifisering van ontwikkelingsprioriteite vir elke provinsie, distrik en plaaslike munisipaliteit, en die uitdrukking van ontwikkelingsplanne in 'n ruimtelike uitleg. Laasgenoemde moet op sy beurt in 'n gedetailleerde plan vir grondgebruik en bestuur geformaliseer word. Die belangrikste besluitneming oor grondgebruik word dus deur die plaaslike munisipaliteite onderneem, in hierdie geval die Matzikama-munisipaliteit. Hul planne moet inpas by breër skaalplanne van die distrik en provinsie en moet rekening hou met die grondgebruiksplan wat vir die eisergemeenskap opgestel is ingevolge die skikkingsooreenkoms van 2015 (Phulisani, in prep.).

Die Wes-Kaapse ruimtelike ontwikkelingsraamwerk beklemtoon die bewaringsbelang van die riviermonding op die Olifantsrivier op nasionale vlak, maar bied weinig spesifieke relevansie vir die bestuur van die riviermonding in die rivier. Die distrik GOP en SDF verdedig die bewaring van die omgewing en natuurlike hulpbronne, sowel as historiese geboue en strukture, maar noem nie die riviermond spesifiek nie. Die SDF van die Matzikama-munisipaliteit erken die belangrikheid van die riviermonding in die streek, maar bied min spesifieke leiding vir die bestuur daarvan. Daar bestaan egter 'n dokument vir bestuursplanriglyne (Urban Dynamics 1998) wat spesifiek vir die laer Olifantsrivier ontwikkel is namens die Weskus-distriksmunisipaliteit as deel van die oorspronklike GOP-ontwikkelingsproses. Hierdie dokument is ontwerp om die raamwerk vir die GOP te bied, en bevat 'n bestuursraamwerk, soneringsplan en riglyne vir die bewaring en ontwikkeling van die riviermonding en omliggende omgewing. Dit stel 'n biosfeerreservaat-benadering voor vir die gebied, met 'n klein kernbewaringsgebied rondom die monding van die riviermond, 'n oorgangsonde rondom die Olifantsdrif-nedersetting, en die res van die studiegebied word as buffersone voorgestel.

Daar is tans min ontwikkeling en gebruik van die riviermondingsgrens, alhoewel daar 'n mate van soutmoeras verloor is. Nietemin is aansoeke om ontwikkeling rondom die riviermondingsgrense gemaak en sal dit waarskynlik in die toekoms toeneem, wat gepaardgaande uitdagings meebring vir die bestuur van die riviermonding. Die gebruik vir ontspanning is relatief laag, behalwe gedurende die piekvakansieseisoen wanneer informele kampering op die soutmoeras langs Papendorp plaasvind, maar dit waarskynlik sal toeneem en die versteuring sal beperk moet word. Die grootste probleem is ligte vliegtuie, vierwielmotorfietse en snelbote, wat habitatte en fauna versteur.

Die gebied val binne 'n strook diamantmynkonsessies langs die weskus, met buitelandse en landelike toegewings wat oor die monding van die riviermonding strek. Dit is in die verlede ontgin en is tans nie aktief nie. Enige aktiwiteit moet voorafgegaan word deur 'n omgewingsimpakstudie en 'n omgewingsbestuursplan word vereis. Die soutpan het op die oomblik geen noemenswaardige invloed op die riviermonding nie. Die herwinning van die soutpan as 'n kunsonderneming word egter ondersteun deur riviermondingsbelanghebbendes. Van groter kommer is tans die ondersoek na prospekter- en mynlisensie-aansoeke wat aan die westelike oewer van die riviermonding gedoen word met die doel om minerale sand te ontgin. Die voorgestelde myngebied sal oorvleuel met groot gebiede wat in die Wes-Kaapse biodiversiteitsraamwerk en Matzikama SDF aangewys is as Kritieke Biodiversiteitsgebied (CBA).

Dit is ook geïdentifiseer dat die riviermonding van die Olifantsrivier gerehabiliteer moet word. In die geval van die riviermonding van die Olifantsrivier, is die herstel van die riviermonding tot 'n beter gesondheidstoestand baie eenvoudig en sal dit hoofsaaklik (in volgorde van prioriteit):

1. Volhoubare visvangpraktyke bevorder en verminder, indien nodig, visvangdruk op die riviermonding verlig;
2. Herstel van die hoeveelheid invloed van varswater;
3. Herstel van die kwaliteit van die water; en
4. Die hinderniseffek van die Lutzville-gang verwyder.

Oor die algemeen hang die mate waarin hierdie faktore bestuur moet word om die gesondheid van die stelsel te herstel, grootliks af van die visie wat ontwikkel is vir die riviermonding, en van die toekomstige beskermingsstatus daarvan.

Visie en doelstellings

'n Visie is 'n verklaring op hoë vlak wat die strategiese bedoeling van 'n bestuursintervensie omskryf. 'n Konsepvisie is ontwikkel in die beginfasies van die konsultasieproses vir belanghebbendes. Hierdie visie is hersien tydens 'n vergadering van die Olifantsriviermondingsbelanghebbendes op 6 Junie 2011 (Notule van die Estuary Interim Forum Vergadering 6 Junie 2011) en is verder verfyn op 'n vergadering wat in Kaapstad gehou is met verteenwoordigers van die vissersgemeenskap, Universiteit van Kaapstad and Masifundise Ontwikkelingstrust in November 2013.

Die riviermonding van die Olifantsrivier is van kritieke belang vir mense en wilde diere; dit moet ekonomiese voordele vir die plaaslike gemeenskap meebring deur volhoubare gebruik van natuurlike hulpbronne en verantwoordelike ekotoerisme; dit moet die kulturele erfenis en praktyke van die plaaslike gemeenskap beskerm en alle Suid-Afrikaners bevoordeel deur bewaring van biodiversiteit en ekosisteemfunksies.

Sleutelbestuursdoelstellings vir die riviermonding in Olifantsrivier is geïdentifiseer en ooreengekom tydens werkswinkels vir belanghebbendes wat in 2008 gehou is. Daar word gesien dat hierdie doelwitte alle ander doelstellings versterk, en hulle word nie beskou as van groter belang as van die ander doelstellings nie.



Ruimtelike sonering

Alhoewel dit aanbeveel word dat geen ontwikkeling aan die westelike oewer toegelaat word nie, moet beperkte ontwikkelingsnodusse aan die oostelike oewer geïdentifiseer word, wat rekening hou met die ontwikkelingsvoorstelle in die Gemeenskapsontwikkelingsgrondverkrigingsplan en ontwikkeling bied vir bestaande gemeenskappe sonder om die lewensbestaan, kulturele erfenis en gevoel van plek te belemmer. Lae digtheid ekotoerisme geleenthede moet ook gebied word. Geen ontwikkeling mag binne die vloedlyn van 1: 100jr plaasvind nie. Enige voorstelle moet in ag geneem word in die proses van die bepaling van die bestuurslyn. Daar moet van die provinsiale owerheid verwag word om met grondeienaars, die gemeenskap vir grondeisers en hul relevante strukture, sowel as lede van die riviermondingsadviesforum in gesprek te tree.

Benewens die aanvaarding van die omvang van die Kusbeskermingsone en die afbakening van die kusbestuur rondom die riviermonding van die Olifantsrivier, word

voorgestel dat 'n gedeelte van die onderste riviermonding, aan die monding van die riviermond, afgebaken word as 'n **vorm van beskermde gebied of gemeenskapsbewaringsgebied**.

Hierdie beskermde gebied sal gesoneer word as 'n "geen-neem" visvanggebied en sal sekere aktiwiteite en gebruik van gemeganiseerde vaartuie beperk. Sonering sal toelaat dat aktiwiteite binne die riviermonding verdeel word, en sodoende hul samewerking moontlik maak sonder dat een aktiwiteit 'n ander verhinder of daarmee bots. Die tradisionele visvangaktiwiteite van die plaaslike gemeenskappe sal egter in hierdie soneringsproses oorweeg moet word. **Hierdie soneringsplan moet aansluit by die visserybestuursplan wat opgestel word in terme van die nuwe kleinskaalse visvangbeleid.** So 'n soneringsplan sal bestuurskoste ook verminder.

Die voorgestelde beskermde gebied strek vanaf die mond tot een kilometer stroomop en sou ideaal gesproke die oewers van die riviermonding insluit waar sensitiewe en bewaringswaardige riviermondingsplantegroei voorkom (Figuur 6). Daar word voorgestel dat hierdie beskermde gebiede die gebied insluit wat strek vanaf die mond een kilometer stroomop en van die middel van die riviermondingskanaal tot by die top van die soutmoeras aan die westelike oewer van die riviermonding. Hierdie gebied word voorgestel as 'n aas (ongewerweldes) en watervogelreservaat.

Die beperking van die gebruik van petrol- of dieselmote enjins slegs vir bestuurs- en navorsingsgebruik, wat al lank 'n tradisie op hierdie riviermonding is, sal ook die versteuring van die natuurlewe en die woestynatmosfeer tot 'n minimum beperk. Die besoekers se vermoë om die voordele daarvan te geniet sal ook beperk word. Dit kan egter nodig wees om vrystellings vir sekere gebruike te gee, mits dit tot die minimum beperk word en behoorlik gemotiveer is (bv. Bestuur en handhawing, toerismebedrywers).

Daar word nie binne die soneringsplan voorsiening gemaak vir akwakultuur nie, aangesien die wisselende soutgehalte en die hoë voedingsinhoud van die stelsel dit ongeskik maak vir akwakultuurondernemings. Grondgebaseerde akwakultuur kan dus oorweeg word in plaas van in-stroom akwakultuur. Die ontwikkeling van so 'n bedryf sal egter met die belanghebbendes moet bespreek en goedgekeur word.

'n Inklusiewe raadplegende proses om 'n soneringsplan op te stel, wat die beskermde gebied aandui, en aktiwiteite wat in verskillende gebiede gepas is, moet onderneem word.

Institusionele reëlins

Die Protokol identifiseer die Matzikama Plaaslike Munisipaliteit, of sy aangewese verteenwoordiger, as die Bestuursowerheid wat verantwoordelik is vir die ontwikkeling van die Olifantsrivier-RBP, sowel as verantwoordelik vir die koördinering van die implementering daarvan. Hierdie implementeringsfunksie kan deur 'n verskeidenheid forums en rolspelers uitgevoer word.

Volgens die Protokol word die rol van die bestaande Olifantsrivieradviesforum geïnterpreteer as 'n adviesdiens aan die Verantwoordelike Bestuursowerheid oor kwessies wat spesifiek verband hou met die bestuur en implementering van die

Riviermondingsbestuursplan, sowel as die middelpunt wat al die belanghebbendes verbind, hul betrokkenheid bevorder en die implementering van die geïdentifiseerde projekplanne vergemaklik. Die breër gemeenskap kan by die OEAF besorgdhede lewer en probleme ophaal. Dit sluit die CPA, belastingbetalersverenigings, NWO's, gemeenskapsgroepe, bewareas, ens., sowel as verteenwoordigers van die omliggende nywerheid en landbou in. Enige verteenwoordigers is verplig om kwessies te identifiseer wat deur hul kiesers gekies is en om terugvoering te gee. Die Forum sal nie die individuele posisies van sy lede verteenwoordig of vervang nie, tensy dit spesifiek opdrag gegee is om dit te doen.

Die suksesvolle implementering van die riviermondingsbestuursplan kan gesien word as afhanklik van die bydrae van 'n aantal regeringsrolspelers, insluitend:

- Wes-Kaapse regeringsdepartemente: Verantwoordelik vir wetgewende steun, insluitend nakoming, befondsing, navorsing en monitering;
- Weskus Distriksmunisipaliteit: Verantwoordelik vir wetgewende ondersteuning en befondsing;
- Toepaslike nasionale regeringsdepartemente, veral Departement van Omgewingsake, Departement Water en Sanitasie (via die streekkantoor), Departement van Omgewing, Bosbou en Visserye, Departement van Landbou, Grondhervorming en Landelike Ontwikkeling ;
- Staatsorgane (SANparks, CapeNature, Berg-Olifants CMA).

Die nasionale departement van omgewingsake is oor die algemeen verantwoordelik vir die nasionale standaardisering van riviermondingsbestuur en die goedkeuring van provinsiale samestelling van riviermondingsbestuurplanne. Direkte betrokkenheid by individuele riviermondings, soos die Olifants, sal via bestaande forums vir interregeringskoördinerings plaasvind. Hierdie forums sal die bestuur van die riviermondings van Olifantsrivier van tyd tot tyd op hul agenda hê, en sluit die volgende in:

- **Wes-Kaapse provinsiale kuskomitee:** verantwoordelik vir die fasilitering van gesamentlike bestuur, effektiewe bestuur en provinsiale koördinerings van riviermondingsbestuur
- **Weskus Distriksmunisipaliteit Kuskomitee:** Verantwoordelik vir die fasilitering van mede-bestuur en effektiewe bestuur.

Bestuursprioriteite

Sewe projekplanne is opgestel vir die doeltreffende en effektiewe bestuur van die riviermondings in Olifantsrivier. Elke plan stem ooreen met 'n sleuteldoelwit en bevat toepaslike bestuursaksies, ondersteunende regulasies, prioriteitsvlak, verantwoordelike instansie (s) en vereiste hulpbronne indien sodanige inligting beskikbaar is. Dit is in 'n algemene volgorde van prioriteit gerangskik, maar besef tog dat die verwaarloosings van enige aspek die algehele sukses in die gedrang bring:

- Bewaar biodiversiteit
- Verbeter plaaslike lewensbestaan
- Handhaaf die ekosisteesgesondheid
- Verseker die betrokkenheid van die plaaslike gemeenskap

- Handhaaf 'n gevoel van plek
- Verhoog die bewustheid
- Vermeer sosiale, kulturele en ekonomiese voordele

Daar moet op gelet word dat daar 'n mate van onderlinge verbintenis is tussen die planne en sommige bestuursaksies, aangesien hulle uiteindelik almal bydra tot die bewaring van die ekosistefunksie en die biodiversiteitspatrone, wat weer lei tot die bewaring van 'n volgehoue aanbod van goedere en dienste wat ekosisteme lewer by die riviermonding.

Die onderstaande tabel gee 'n samevatting van die bestuursdoelstellings per prioriteitsarea as deel van die Prestasiemoniteringsplan:

BESTUURSDOELWITTE	PRESTASIE AANWYSER	TYDSBEREKENING	WETGEWING	VERANTWOORDELIKEID
1. Beskerming van biodiversiteit en gevoel van plek.				
Vestig 'n spesiale bestuursgebied (SMA)	Riviermond van die Laer Olifantsrivier ontvang formele beskerming as SMA	Een keer per jaar	ICM-wet NEM: PAA	CapeNature, OEAF, DEA
Fasiliteer die instelling van 'n funksionele mede-bestuurskomitee vir riviermondingshulpbronne.	Bestuur van mede-bestuurskomitees en notules van vergaderings.	Evalueer twee keer per jaar	MLRA	DFFE, DEA, OEAF, RMA
Integrasie in IDP / SDF	OEMP word weerspieël in die plaaslike / distrik IDP en SDF, en die kusbestuur word gekontroleer	Elke IDP / SDF hersieningsiklus	ICM Wet, MSA	Matzikama LM. RMA
Reguleer bootverkeer	Bootvaart en ander riviermondings wat gebruik word, kom slegs binne aangewese gebiede voor.	Elke vyf jaar	ICM-wet, MSA, Seekus Wet	Matzikama LM, WCDM, RMA
2. Samewerkende en effektiewe bestuur				
Benoem Olifantsrivieradviesforum	Bevestigde lede en het OEAF saamgestel	Einde van die eerste jaar	ICM-wet	CapeNature
Definieer samewerkingsreëlings	Bevestigde rolle en verantwoordelike van deelnemende agentskappe	Evalueer elke twee jaar	ICM-wet, NEM: PAA	OEAF, CapeNature, Matzikama LM, DEA, DWS

Bekom finansiering	Befondsing word verseker vir volgende 5 jaar	Assesseer twee keer per jaar	ICM Wet, NWA, CARA, MSA	Matzikama LM, DEA & DP, Sleutelvennote
Verskaf hulpbronne en kapasiteit	Kantoorruimte verkry en voldoende toegerus, bemand deur kundige en goed opgeleide permanente personeel.	Assesseer twee keer per jaar		Matzikama LM, DEA & DP, Sleutelvennote
3. Herstel van riviermondingsgesondheid				
Veilige varswaterinset	Ekologiese gesondheidskategorie B word tweemaal behaal	Tweejaarliks vir DWS	NWA	DWS, Matzikama LM, OEAF, CapeNature
Bevorder rehabilitering van habitat	Gegradeerde habitat word gerehabiliteer. Verbetering in ekologiese gesondheidsindekse.	Ad hoc visuele monitoring tydens normale daaglikse aktiwiteite	MPRDA	CapeNature Matzikama LM
Verminder die versteuring van die funksionele sone van die riviermonding.	Onttrekking en voorkoming van nadelige mynaktiwiteite. Verbetering in ekologiese gesondheidsindekse.	Een keer per jaar	MPRDA	CapeNature, Matzikama LM, DEA, DMR
4. Navorsing en monitoring				
Bevorder wetenskaplike navorsing met plaaslike kennis	Toename in aantal navorsingsprojekte en moniteringsprogramme	Een keer per jaar		Matzikama LM, OEAF, CapeNature
Monitor riviermondgesondheid	Deurlopende databasisse en verslae	Tweejaarliks vir DWS vervaardig Maandeliks vir OEAF	NWA	Matzikama LM, DWS, OEAF, CapeNature
Monitor menslike gebruik en sosio-ekonomiese toestande	Deurlopende databasisse en verslae geproduseer	Ad hoc visuele monitoring geproduseer word tydens normale daaglikse aktiwiteite	MLRA	Matzikama LM, OEAF, CapeNature
5. Die verhoging van openbare bewustheid				

Skep meganismes vir kommunikasie met belanghebbendes	Wydverspreide en effektiewe kommunikasie aan 'n verskeidenheid belanghebbendes wat goed ingelig is via hul voorkeurmetode van kommunikasie	Een keer per jaar	ICM Wet	Matzikama LM, OEAF, CapeNature
Ontwikkel onderwys- en bewusmakingsprogram	Besoekersentrum wat oop is vir die publiek. Toename in aantal nuusbriewe, pamflette, plakkate Voldoende aantal kennisgewingbord e	Een keer per jaar	ICM Wet	Matzikama LM, OEAF, CapeNature
6. Die bevordering van ekotoerisme				
Vestig en bestuur besoekersgeriewe	Toename in aantal toeriste per jaar Toename in toerisme-verwante ontwikkeling en besighede / ondernemings			Matzikama LM, OEAF, CapeNature
Bemark die Olifantsriviermonding	Toename in aantal nuusbriewe, pamflette en plakkate. Toename in aantal toeriste per jaar			Matzikama LM, OEAF, CapeNature
7. Die verbetering van plaaslike lewensbestaan				
Volhoubare gebruik van riviermondingshulpbronne	Geïntegreerde visserybestuursplan is ontwikkel Stel aantal permitte wat aan die plaaslike gemeenskap uitgereik word, in Die uitvoerbaarheid van die marikultuur operasie word bepaal.		MLR	DEFF DEA: OC Matzikama LM CapeNature

Voorsien aanvullende lewensbestaan	Toename in aantal werknemers Deurlopende voorsiening van werkseleenthede			Matzikama LM DEA: Alternatiewe lewensbestaan CapeNature
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ABBREVIATIONS

amsl	Above mean sea level
amsl	Above mean sea level
C.A.P.E.	Cape Action for People and the Environment
C.A.P.E.	Cape Action for People and the Environment
CARA	Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
CCA	Community Conservation Area
CDLAP	Community Development Land Acquisition Plan
CFR	Cape Florisitic Region
cm	Centimetre
CML	Coastal Management Line
CMP	Coastal Management Programme
CMP	Communal Property Association
CPA	Community Property Association
CPZ	Coastal Protection Zone
CSIR	Council for Scientific and Industrial Research
DEFF	Department of Environment, Forestry and Fisheries
DALRRD	Department of Agriculture, Land Reform And Rural Development
DEA	Department of Environmental Affairs (formerly DEAT)
DEA: O&C	Department of Environmental Affairs: Oceans & Coasts Branch (formerly MCM)
DEA&DP	Western Cape Government's Department of Environmental Affairs & Development Planning
DWS	Department of Water and Sanitation (formerly DWAF)
EMP	Estuarine Management Plan
ERC	Ecological Reserve Category
ha	hectare
HWM	High-Water Mark
ICM Act	See NEM:ICMA
IDP	Integrated Development Plan
Km	Kilometre
NBA	National Biodiversity Assessment
MCM	Directorate Marine and Coastal Management (formerly part of DEAT, now DEFF)
MEC	Member of the Executive Council
MLRA	Marine Living Resources Act (Act No. 18 of 1998) as amended
Mm ³	Million cubic metres
MSA	Municipal Systems Act (Act No. 32 of 2000)
NEM:BA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004) as amended
NEM:ICMA	National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008) as amended
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) as amended
NEMA	National Environmental Management Act (Act No. 107 of 1998) as amended
NWA	National Water Act (Act No. 36 of 1998) as amended

OEAF	Olifants River Estuary Advisory Forum
OEMP	Olifants River Estuarine Management Plan
ppt	parts per thousand
RMA	Responsible Management Authority
SDF	Spatial Development Framework
SMA	Special Management Area
SSFP	Small-scale Fisheries Policy
The Protocol	National Estuarine Management Protocol
TPC	Threshold of Potential Concern
UCT	University of Cape Town
UCT	University of Cape Town
WCDM	West Coast District Municipality

1 INTRODUCTION

1.1 Background

The Olifants River estuary is one of 279 functional estuaries in South Africa (Turpie 2004) and one of four permanently open estuaries on the west coast (Whitfield 2000). It is the 12th largest estuary in the country, with a total area of 702 hectares (ha). The estuary is one of the most important in the country in terms of its conservation value from an ecological, social and cultural heritage perspective. Based on an index which takes size, estuary type, location and biodiversity (plants, invertebrates, fish, birds) into account, the estuary is ranked in the top five (Turpie et al. 2004, Turpie & Clark 2007). It has been identified as an Important Bird Area (Barnes 1998) and a desired protected area in the conservation planning assessment conducted for the Cape Action for People and the Environment (C.A.P.E.) programme (Turpie & Clark 2007) as well as in other studies (e.g. Turpie et al. 2002, Turpie 2004). The estuary and surrounding landscape has formed the basis of the culture and livelihoods of the local Ebenhaeser community for several centuries. The traditional net fishing families of Ebenhaeser continue to depend on the estuary for a significant component of their livelihoods (Sowman 2009, Masifundise and EEU 2011). In addition to its socio-cultural and heritage importance, the estuary provides critical ecosystem goods and services. The estuary is also noteworthy in that it is one of the least developed of the large permanently-open estuaries in South Africa, providing a valuable sanctuary for flora and fauna as well as for visitors. However, mounting pressures could reduce this value, as water abstraction and pollution degrade estuary condition, fish stocks are affected by fishing pressure along the coast and in the estuary, mining interests focus on the coastal minerals and as demand for development proceeds up the west coast.

Planning for the protection and management of the Olifants River Estuary needs to be undertaken in the broader context of the area, giving due consideration to the links between the estuary and marine environment, as activities taking place in the adjacent marine ecosystem can have a direct impact on the health of the estuarine ecosystem.

Furthermore, management planning for the estuary takes place within the context of a complex set of inter-related legal, policy and development frameworks. The Ebenhaeser community was historically dispossessed of their land surrounding the estuary. Their land claim has been accepted and they are currently in the process of finalising the terms of their Settlement Agreement and planning the restitution of certain lands and its subsequent development. The Community Development and Land Acquisition Plan (CDLAP) (EcoAfrica, 2013) sets out scenarios for post settlement development and includes restitution of most of the land lost in the 1920's to the people of Ebenhaeser, as well as acquisition and development of state land in the vicinity of Papendorp, and creation of employment opportunities and skills training for members of the community. They do however necessitate that the rights of the Ebenhaeser community as the owners of the land adjacent to the estuary and historical rights holders are recognised in any future management and decision-making processes.

This document is a Management Plan for the Olifants River Estuary and should be read in conjunction with the Situation Assessment Report which forms the background material for the development of the management plan. Anchor Environmental Consultants cc was tasked with preparing the initial plan in 2008/2009 under the auspices of the C.A.P.E. Regional Estuarine Management Programme. The main aim of programme was to develop a conservation plan for the estuaries of the Cape Floristic Region, and to prepare strategic management plans for each estuary.

1.2 Purpose and scope of the Olifants River Estuarine Management Plan

Drawing on the Situation Assessment prepared for the Olifants River Estuary (Anchor Environmental Consultants 2008), inputs from key stakeholders (Anchor Environmental 2008 – Olifants River Estuarine Management Plan Stakeholder Consultation Report), EEU and Masifundise Development Trust Reports, respectively March 2011 and November 2013) and other supporting documents prepared for the C.A.P.E. Estuaries Programme (e.g. Turpie & Clark 2007 – Cape Estuaries Classification, Prioritisation, Protection and Rehabilitation report), the Olifants River Estuarine Management Plan (EMP) sets out the Vision and Objectives for the Olifants River Estuary. It also identifies the management objectives required to meet these key objectives, which correspond to sectors of governance (e.g. conservation, water regulation, etc.), and indicates the main strategic activities required in the five years following adoption in order to achieve the overall vision. A plan of implementation is provided for each key objective and will result in a number of deliverables. While planning for some emergencies (e.g. floods) is part of the Olifants River EMP, it remains possible that unforeseen disasters could disrupt the prioritisation set out here.

This EMP is a strategic planning document, and as such does not provide detailed, routine planning for the management of the estuary. This detail should be captured by the Responsible Management Authority (RMA), or its assigned representative, in its Governance Tool, annual budget, Plan of Operations, Integrated Development Plan (IDP), Annual Performance Plan etc. (as applicable) with the management plan forming the platform for more fine-scale planning. Furthermore, the National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008 as amended) (ICM Act) provides for a report to be submitted to the National Department of Environmental Affairs (DEA) every two years in respect to implementation once an EMP has been signed off and approved. The EMP should also be recognized as a dynamic document, whereby certain components could be revised as important new information becomes available and management priorities change. Adaptive management should be continually pursued through a process of annually reviewing the progress made in achieving the management objectives. Finally, the management plan should be subject to a comprehensive revision on a five-year cycle, as required by the Protocol.

The flow diagram below shows how the EMP for the Olifants River Estuary (this document) links with other documentation (e.g. the Situation Assessment Report) and Stakeholder consultation processes, and how it is embedded within annual and longer term management and review processes.

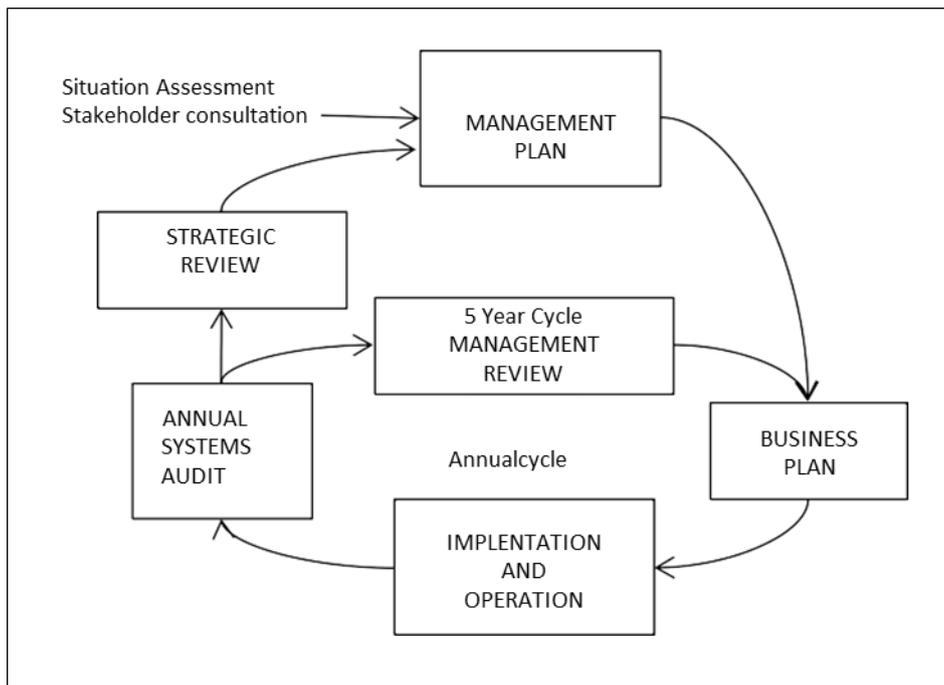


Figure 1: Process of Review and Implementation

1.3 Legal framework and mandates

Chapter 4 of the ICM Act aims to facilitate the efficient and coordinated management of all estuaries, in accordance with:

- a) The Protocol (Section 33) approved by the Ministers responsible for the environment and water affairs; and
- b) Estuarine management plans for individual estuaries (Section 34).

The Protocol itself, promulgated in 2013, provides a national policy for estuarine management and guides the development of individual EMPs. It must be ensured that the EMPs are aligned with the Protocol and the National Coastal Management Programme (CMP) (DEA 2014). The Protocol lays out the following:

- a) The strategic vision and objectives for achieving effective integrated management of estuaries in South Africa;
- b) The standards for the management of estuaries;
- c) The procedures regarding how estuaries must be managed and how the management responsibilities are to be exercised by different organs of state and other parties;
- d) The minimum requirements for EMPs;
- e) Who must prepare EMPs and the process to be followed in doing so; and
- f) The process for reviewing EMPs to ensure that they comply with the requirements of the ICM Act.

One of the pillars of successful integrated coastal (including estuarine) management is the establishment of effective institutional arrangements to underpin both cooperative government and cooperative governance. Cooperative governance is a system that

allows government and civil society to communicate and contribute to shared responsibility in respect of coastal management objectives and must be well-organized and widely representative of all coastal stakeholders. The ICM Act details the institutional arrangements that will contribute to cooperative coastal management in South Africa. These arrangements are made at national, provincial and municipal government levels, and the embodiment of cooperative coastal governance is vested in what will be known as coastal committees. The ICM Act provides for the permissive, i.e. if so required, establishment of municipal coastal committees, but at a national and provincial level however, the Minister and Members of the Executive Council (MECs) of coastal provinces are directed to establish national and provincial coastal committees, respectively. Provincial coastal committees must be established within one year of the commencement of the ICM Act.

The National Coastal Committee (the MINTEC Working Group 8) is established by the Minister, and its powers determined by notice in the Government Gazette. It is supported administratively by DEA. The Premier of each coastal province must identify a lead agency (organ of state) that is responsible for the coordination, monitoring and implementation of the provincial coastal management programme, monitoring the state of the environment in the coastal zone, and identifying relevant trends and priority issues. The lead agency for coastal management is directly responsible to the MEC. Each metropolitan, district or local municipality which has jurisdiction over the coastal zone may establish a municipal coastal committee. The establishment of Municipal Coastal Committees is discretionary.

The lowest tier of institutional arrangements for estuarine management comprises the RMA and the estuary advisory forums. The role of the estuary advisory forum is to act as the hub which links all stakeholders, including both organs of state and civil society, so as to facilitate cooperative management and effective governance in terms of the EMPs, as well as facilitate and monitor implementation of an EMP. The role of RMA is for developing and co-ordinating and monitoring implementation of EMPs.

1.4 Mandate and responsibilities of the RMA

The Protocol identifies CapeNature as the management authority responsible for developing and co-ordinating implementation of the Olifants River Estuarine Management Plan. The estuary is included in the Western Cape Protected Area Expansion Strategy. The entire estuary is situated within the Matzikama municipal boundary (Figure 2).



Figure 2: Location of the Olifants River Estuary within Matzikama Municipality

The RMA is responsible for overall co-ordination of the actions of other implementing agencies, and not the implementation actions themselves. Section 7.3 of the Protocol 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 Protocol 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 into that protected area’s management plan as contemplated in section 39 of NEMPAA.”*

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

- a) follow a public participation process in accordance with Part 5 of Chapter 6 of the ICM Act; and
- b) ensure that the EMP and the process by which it is developed are consistent with:
 - i) the Protocol; 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 ICM Act;
- c) If applicable, ensure that relevant legislation is enacted to implement the EMP; and
- d) Submit a bi-annual report to the Minister on the implementation of the EMP, the legislation and any other matter.

Coordination of the implementation actions by the RMA and its strategic partners (Department of Forestry Fisheries and Environment [DFFE], West Coast District Municipality (WCDM), Western Cape Provincial Government [DEA&DP], Department of Water and Sanitation (DWS), Department of Agriculture [DoA]), will be supported by the Olifants River Estuary Advisory Forum (OEAF) representing other key stakeholders on the estuary.

2 SUMMARY OF THE SITUATION ASSESSMENT

2.1 Introduction

The Olifants River Estuary is one of the largest of South Africa's 279 estuaries, with a total area of 702 ha of typical estuarine habitat plus 797 ha of floodplain saltmarsh, together making up 1499 ha. It is one of the most important estuaries in the country from a conservation perspective. The estuary is also noteworthy in that it is perhaps the least developed of the large permanently open estuaries in South Africa, providing a valuable sanctuary for flora and fauna as well as for visitors. However, mounting pressures could reduce this value. Nevertheless, there is still good opportunity for proactive planning to form a vision for the estuary and set in place a management strategy that will achieve that vision.

2.2 Geographic and socio-economic context

The Olifants River Estuary lies 250 km north of Cape Town on the West Coast and forms the mouth of the Olifants-Doring river system. The Olifants-Doring Catchment straddles the Northern and Western Cape Provinces, and the estuary is located in the Matzikamma Local Municipality, within the West Coast District Municipality in the Western Cape Province. The estuary extends from its permanently open mouth (31°42'S; 18°11.34'E) some 36 km upstream to the low water causeway near Lutzville (31°33.8'S; 18°19.78'E). The channel varies from 550 m wide just upstream of the mouth to 20 m at the head of the estuary. Depth is mostly 2-3 m. The lateral extent of the estuary is defined by the limit of estuarine vegetation, including flood plain saltmarsh.

The estuary drains one of the largest catchments in the country. Rainfall in the catchment ranges from 1 500 mm in the south down to 300 mm in the north. The area is largely arid, dominated by Succulent Karoo vegetation, as well as having Fynbos vegetation in the south and Nama Karoo vegetation in the north. The winter rainfall in the south is the dominant source of flow into the estuary, via the Olifants River, whereas the Doring River, its major tributary, is intermittently dry. The Doring is more saline and carries more suspended solids than the Olifants due to differences in catchment soils. Flow is regulated by the Clanwilliam and Bulshoek Dams on the Olifants River and there has been a proposal to increase the capacity of the Clanwilliam Dam.

Around 90% of the catchment area is untransformed, much of this in nature reserves and the rest used for livestock. There is some dryland farming (e.g. rooibos tea) and significant irrigation along the Olifants River (e.g. citrus, grapes). Mining for gypsum, salt, sand, mineral sands and diamonds also features in the area. Interest in mineral sands mining on the northern bank of the Olifants River estuary has recently picked up with Tormin (the operating entity of Australian Mineral Sands Resources (Pty) Ltd) indicating it intends to expand substantially along further pristine stretches of the coastline and along the sensitive estuary. Agriculture is the backbone of the area's economy, though tourism is also growing in importance.

This is the most sparsely populated catchment in the country, with most of the population in the Koue Bokkeveld and Olifants River Valley. The population is predominantly Coloured (70%) and White (20%), and more than 90% of people are Afrikaans-speaking. The majority

are poor, but employment levels and services are reasonable compared with the rest of South Africa. Much of the land around the estuary on the southern bank is owned by the local communities who have recently been awarded a significant land claim.

The people of Ebenhaeser and Papendorp have a long history of fishing in the Olifants River estuary. These communities were descendants of indigenous Khoi-San groups that settled in the area in the Olifants River valley in about the 17th century (Parkington, 1977). The realities of this fishing community today are rooted in the history of a land exchange which took place in 1927 when the Colonial government at the Cape forcibly resettled this community onto unfertile land near the mouth of the Olifants River to provide agricultural opportunities for “poor whites” seeking livelihood opportunities. Due to the poor soils and lack of water at the resettlement sites, many people became increasingly reliant on fishing as a main source of food and livelihoods (Sowman, 2009).

The historical record paints a picture of a marginalised community, dependent on local resources for food and livelihoods with little assistance from government (LRC, 2003). Currently, there are approximately 1200 households in the Ebenhaeser and Papendorp settlements of which approximately 120 are involved in fishing as a source of food or contribution to livelihood (Williams, 2013; EcoAfrica, 2012). This is a poor community with a high level of unemployment (approximately 26%) and relatively low levels of education (EcoAfrica, 2013). Those people not engaged in fishing are involved in small-scale agriculture, *ad hoc* work on adjacent commercial farms, or gain short-term employment from government public works and poverty alleviation projects. Many residents rely on social grants from the government to provide for their basic requirements (Williams, 2013).

There are currently 45 permits issued for this gillnet fishery. Each gillnet fisher can operate with one crew member or “bakkiemaat”, and thus according to current permit conditions, 90 fishers are able to fish on the estuary at any one time. However, in practice there are far fewer fishers on the estuary on a regular basis and the numbers are declining due to unreliable catches and as more fishers get involved in fishing at sea. Over the past 9 years, while a new small-scale fisheries policy has been developed, interim relief permits have been allocated to small-scale fishers in coastal fishing villages throughout South Africa on an annual basis to address their immediate socio-economic needs. Approximately 30 fishers from Ebenhaeser and Papendorp have obtained interim relief permits to fish at sea. Although there are several problems in terms of exercising these interim rights (e.g. difficulties to find transport to get to the launching site at another fishing village), this fishery is far more lucrative and thus these 30 fishers tend to fish at sea in preference to the estuary. However, when fishing is good in the estuary, marine fishers will also fish in the estuary and this is causing some tensions amongst river and sea fishers (Sowman, forthcoming).

2.3 Ecological characteristics and functioning of the estuary

The mouth of the estuary is permanently open. The Lutzville Bridge marks the extent of tidal water level fluctuations. The mean annual runoff reaching the estuary varies around 715 Mm³/annum, some 33% less than in the natural state. Both low flows and winter flood peaks have been reduced, reducing the input of sediment to the estuary. This is thought to have deepened the channel, allowing tidal penetration further upstream. Unlike under

natural conditions, when it was rare, this allows the estuary to experience a marine-dominated state for about six months of the year (November to April), replacing a situation where saline water only extended to the middle reaches. A freshwater-dominated state prevails during winter. However, current observations by local fishermen point to evidence of the expansion of sand banks around the river mouth. This could be the result of reduced river flow not scouring out the mouth area.

Salinity distribution in the estuary affects the distribution and abundance of plants and animals. Marine dominance in summer means that salinity penetrates far into the estuary, measuring 5 parts per thousand (ppt) some 20 km upstream throughout the water column. In winter, freshwater flows out on top of the saline water, and the latter only penetrates a short distance upstream. The estuary is warmer in summer than winter and has lower oxygen concentrations in summer. Oxygen is depleted in deeper, slower moving water, especially in the middle of the estuary in summer. Water clarity is affected by the relative input from the Olifants catchment (clear), Doring catchment (turbid) and the sea (clear), with the estuary being clearer in summer than winter.

Nutrients (e.g. nitrogen, phosphorus, silica) enter the estuary in sea (especially during upwelling) and river water (especially following first rains), but the contribution by river water has increased enormously in recent decades due to agricultural runoff, leading to problems of weed growth in the estuary.

Microalgae form the bottom of the food chain and comprise the phytoplankton in the water column and the benthic microalgae on the bottom. The phytoplankton is dominated by flagellates in river dominated areas and diatoms in marine-dominated areas, and their abundance is influenced by the concentrations of nutrients. Little is known about the benthic microalgae, but their abundance in winter does reflect the high nutrient loads of the system.

Vegetation of the estuary can be divided into four types of communities:

1. Macroalgae include the seaweeds at the mouth as well as species indicative of nutrient enrichment near the top of the estuary. The latter include *Enteromorpha*, which fouls boat propellers and pumps and the mat-forming, floating macrophyte known as duckweed, which is abundant in the upper reaches.
2. Submerged macrophytes comprise pondweed, which forms dense beds in the upper reaches, and which has increased due to nutrient enrichment, and eelgrass, which grows in the lower reaches, providing important habitat for juvenile fishes.
3. Reeds and sedges are important for function and diversity, but do not tolerate high salinity and have receded upstream due to reduction in freshwater inflows.
4. Salt marsh occurs mainly in open estuaries, and the Olifants River Estuary contains a high proportion of this habitat in South Africa. It contributes to system productivity and biotic diversity, providing habitat and shelter for numerous invertebrate and bird species. The salt marshes of the Olifants River Estuary are also fairly unusual, with saltmarsh on the floodplain a remnant of a larger system in the past. Despite grazing and some clearing, disturbance to salt marsh has been only minor.

The invertebrate community comprises zooplankton and the benthic communities in and on the sediments. The invertebrate communities of the Olifants River Estuary are characterised by high abundance relative to other South African estuaries, and high species richness for the west coast, where diversity is usually fairly low. The dominant invertebrate species are *Pseudodiaptomus hessei* (zooplankton), the amphipod *Melita zeylanica*, the crown-crab *Hymenosoma orbiculare* (hyperbenthos), the polychaetes *Ceratonereis keiskamma*, *Desdemona ornata* and the amphipods *Corophium triaenonyx*, *Grandidierella lutosa* and *Melita zeylanica* (benthos). Zooplankton and hyperbenthos abundance is highest in the middle reaches of the estuary and subtidal benthos is highest at the top of the estuary. These invertebrates are important in the diets of fish and birds.

Fish are particularly reliant on estuaries for sheltered habitat in southern Africa, and different species depend on them to different extents. A total of 38 fish species from 30 families have been recorded in the Olifants River Estuary, of which 18 can be regarded as either partially or completely dependent on the estuary for their survival. These include some highly valuable species such as white steenbras as well as harders. The estuaries on the west coast are crucial in maintaining the range and stock integrity of estuarine and estuarine dependent species along the entire west coast, and the Olifants River Estuary is an important nursery area. The decline in the harder stock and marine gill-net fishery catches on the west coast has been attributed to recruitment over-fishing in the Berg and Olifants River Estuary gill net fisheries (Hutchings & Lamberth 2003). Work by Rice (2015) further suggests that pressure on line fish species found in the Olifants estuary by other fishery sectors such as trawl fishery and commercial line fishery contribute significantly to the status of these stocks.

It is likely that there have been significant changes in the fish fauna compared with natural conditions, with a reduction in diversity and fish sizes having occurred due to changes in freshwater flows and fishing. Harder and estuarine round herring are now the dominant fish species in the estuary and elf also make up a significant proportion of fish numbers. The majority of estuary-dependent species are most abundant from 5-20 km from the mouth, in salinities of 0-20 ppt and water clarity less than 100 cm. Adequate management needs to be applied to the estuary, however, to ensure the survival of these species as they are highly mobile moving from the mouth right up to the top of the estuary.

Birds are probably one of the most important components of the estuary's biodiversity. The diversity and numbers of birds are very high, due to the size and diversity of habitats on the estuary, and its lack of disturbance. Some 72 water bird species occur on the estuary (not including vagrant visitors), of which 21 are long-distance migrants that mostly spend the summer on the estuary. Bird numbers swell from 3200 in winter to 5900 in summer, on average, though much higher numbers have been recorded at times. The area near the mouth supports about 80% of the birds of the estuary (apart from the marine cormorants at the rocks), and 90% are found within 9km of the mouth. Different species are characteristic of different habitats. Intertidal habitats support the highest densities. Very low densities of birds occur in the saltpan and supratidal marshes, but the community composition is distinct. The sand banks in the lower estuary are important roosting areas for terns and gulls. The upper reaches are home to waterfowl, which tend to prefer fresh or brackish habitats. Apart from the marine cormorants, the birds on the estuary include invertebrate feeders (mostly

waders), piscivores (mostly terns), herbivores (waterfowl) and generalist feeders (gulls), with the first two groups being dominant in summer. The bird community is highly responsive to change reflecting wet and dry years on the estuary.

2.4 Ecosystem services

Estuaries can provide a range of services that have economic or welfare value. In the case of the Olifants River Estuary, the most important of these are the small-scale fishery, the recreational value and the nursery value of the estuary. There may be additional values, such as carbon sequestration, but these are not well understood and are probably fairly minor.

The estuary currently supports a small-scale gill net fishery involving about 45 permit holders and their crew, as well as a number of unlicensed fishers although this number has reduced due to interim relief permits allocated for marine resources to about 30 fishers. While earlier research suggested that the fishery landed about 100-200 tons of harders, plus some 0.4 – 1.2 tons of by-catch species per annum, these figures are considered an overestimate since recent research based on monitoring data suggest much lower total landing of both harder and bycatch (Carvalho *et al.*, 2009; Rice, 2015). Fishing mainly takes place during the summer low-flow period. The fishery provides an important source of food to households and a substantial portion of income to fisher households.

The estuary provides a nursery area for several fish species that are caught in the commercial and recreational inshore fisheries along the west coast, including harders, white steenbras and silver kob. The latter two species once made up a substantial proportion of these catches but their stocks have since declined. Research undertaken in the late 1990s and early 2000s suggest that estuarine fish make up about 25% of the value of the gill- and seine-net fisheries and 0.3% of the value of the commercial boat fisheries on the west coast, or about 8% of the overall value of West Coast inshore marine fisheries, and the Olifants River Estuary contributes about 23% of the estuarine habitat. Taking into account the degree to which these fish are dependent on estuaries, the nursery value of the Olifants River Estuary is estimated to be some R3.45 million per year. However, given the changes in the net fisheries over the past 10 years, these figures need to be treated with caution.

The estuary is striking against its arid backdrop, and with its fishing and birdwatching opportunities, provides a high quality recreational experience which is generally uncongested. Unlike most large estuaries in South Africa, there is no major urban settlement around the mouth of the Olifants River Estuary, though Strandfontein village is nearby, and visitors currently camp informally beside the estuary at Papendorp. This informal camping creates significant problems during the Christmas/New Year and Easter holiday periods due to the lack of services and infrastructure and the damage to sensitive vegetation caused by vehicles and campers. The bulk of the Olifants River Estuary recreational linefish catch is made within 500m of the mouth and comprises silver kob (collapsed), white steenbras (collapsed), west coast steenbras (optimally exploited) and elf (overexploited)². The status

² Stock status taken from Mann (2013)

of these stocks is due to the general decline in the country. Recreational anglers value the sport and experience, and expend considerable sums on this activity, largely irrespective of their catch returns. Although small, the Olifants River Estuary recreational fishery is probably worth R0.6 – R1.3 million per annum. However, concerns about the impact of the recreational fishing on lone fish stocks and their interference with the small-scale fishery, have led to calls for greater restrictions on recreational anglers.

2.5 Regulatory context and related management issues

Little legislation has been designed for estuaries in particular. However, the fact that estuaries contain freshwater, terrestrial and marine components, and are heavily influenced by activities in a much broader catchment and adjacent marine area, means that they are affected by a large number of policies and laws. The ICM Act, amended in 2014, requires that a management plan be developed for each estuary according to a national protocol. The National Estuarine Management Protocol promulgated in 2013 under the ICM Act, provides the national policy for estuary management and guides the development of individual EMPs. It stipulates the minimum requirements for the content of an EMP, prescribes the procedures to be followed in developing an EMP and any potential institutional arrangements. Importantly, the Protocol provides clarity as to which authorities are responsible for the development, coordination, and implementation of an EMP. The designated Responsible Management Authority is CapeNature. The Protocol stipulates that the responsible management authority must budget accordingly for the development and implementation of these plans.

At a national level, estuary management falls mainly under two national government departments: the DWS, responsible for water resources, and DEA, responsible for everything else, e.g. land use, living resources. Environmental management in most instances is devolved to provincial level. Management and conservation of marine living resources is an exception in this respect, with responsibility for coastal and estuarine management issues residing with the Directorate Oceans and Coast of DEA and marine resources management with DEFF. At a municipal level, by-laws are passed which cannot conflict with provincial and national laws.

Water quality and quantity are mainly controlled under the National Water Act 36 of 1998 (NWA). This makes provision for an environmental reserve which provides the quantity and quality of water flow required to protect the natural functioning of each water resource, including estuaries. The extent to which an estuary's functioning is catered for is determined by the designated future management "class" (where classes A – F describe state of health), called the Ecological Reserve Category (ERC). In future, this will be determined in a recently-developed, holistic classification process. Meanwhile it is decided by DWS on the basis of a recommendations made from a reserve-determination study ("Resource Directed Measures") and socio-economic considerations. Such a study was completed for the Olifants River Estuary in 2006. The study determined that the estuary is currently a C-class estuary ("moderately modified"). Implications of several possible future flow scenarios were determined, and on the basis of this and the national importance of the estuary, the recommendation has been made to provide enough flow (i.e. restore some flows) to raise the estuary to a B-class ("largely natural"). Water quality specifications were also

recommended based on maintaining a B-class estuary, which means taking measures to control inputs of organic and inorganic pollutants entering the river and estuary. A final decision on the ERC has yet to be taken by DWS.

Exploitation of living resources in the estuary is governed by the Marine Living Resources Act (1998) and its Amendments as well as the recently promulgated Small-scale Fisheries Policy (SSFP)(DEFF, 2012) and associated regulations (DEFF, 2016). Main objectives of the Marine Living Resources Act (Act No. 18 of 1998, as amended) (MLRA) and SSFP Policy include sustainable use of resources, promotion of ecosystem and biodiversity protection, use of marine resources for socio-economic development and poverty alleviation as well as transformation of the fishing sector. The new SSFP recognizes the rights and socio-economic needs of small-scale fisheries, and affords them respect and legal protection. Of particular importance is the requirement that these small-scale fishers be granted preferential access to marine resources especially where such communities have historically depended on such resources.

However, there have been on-going concerns amongst marine scientists about the negative impacts of the gillnet fishery on resources and estuarine health, as well as on the value of the estuary as a nursery area (Anchor Consulting, 2008). Consequently, Marine and Coastal Management (MCM) within DEAT (now DEFF) devised a policy in 2005 to eliminate commercial fishing in estuaries, rescinding all permits on the Berg estuary, but giving the Olifants River Estuary a period of 10 years to phase out gill net fishing because of its importance to the Ebenhaeser community. Since then, independent research (Fielding et al., 2007; Carvalho et al., 2009) has asserted that the fishery is sustainable, although it may be operating below maximum economic yield. In addition, workshops with fishers and other estuary stakeholders during 2011-2013 highlighted how the fishers' lives and livelihoods were inextricably linked to estuarine resources and that in order to pursue a sustainability agenda, it was imperative to address both livelihood and conservation goals (Jackson et al., 2013). Furthermore, in terms of the new SSFP, fishers are encouraged to enter into a co-management arrangement with DEFF and fishers are eager to be more involved in stewardship and management of resources. Other provisions in the SSFP such as the establishment of co-operatives, and the support from government to develop the fisheries (e.g. support for infrastructure development, beneficiation of product and capacity development) suggest a fundamentally different approach to managing the fishery once the SSFP is implemented (Sowman et al., 2014).

Under the Seashore Act of 1935, the estuary up to the high-water mark belongs to the state. CapeNature implements a lease system to manage structures in this zone. In terms of the ICM Act, the Minister must determine the boundaries of coastal public property to improve public access to the seashore; protect sensitive coastal ecosystems; and secure natural functioning of dynamic coastal processes to protect people, property and economic activities from risks (section 7A). Furthermore, the ICM Act provides guidance on the sustainable use, development and protection of the coastal zone. The ICM Act provides for the determination of a Coastal Protection Zone (CPZ) on coastal land and adjacent to the High-Water Mark (HWM) and extending 1km from the high tide mark (including in estuaries) for undeveloped land and land zoned for agricultural use, which is narrowed to 100 m in areas zoned for other 'urban' land uses (e.g. residential, industrial or commercial). In the

case of the Olifants, all land surrounding the estuary falls into the former categories, and thus in terms of ICM Act, a default CPZ of 1 km would apply around the whole estuary. However, the boundaries of this zone may be adjusted by the MEC and, in the Western Cape; the 10 m topographical contour is the proposed maximum width of the CPZ around estuaries, as per the West Coast District Setbacks Project (DEA&DP 2014). Within the CPZ, no new land transformation or development may take place without authorisation issued by the responsible authority (MEC or Minister depending on the nature of the activity). There is also provision to create a larger CPZ under the ICM Act where necessary. Note though that an exemption has been afforded to landowners in respect to land clearance activities on the land below the irrigation canal and certain other areas adjacent to the Olifants River Estuary in terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA) and National Environmental Management Act (Act No. 107 of 1998) (NEMA). It is likely that this exemption will be applicable in terms of the ICM Act as well, but is probably applicable to land clearance for agriculture only. This needs to be confirmed.

The Municipal Systems Act (Act No. 32 of 2000) (MSA) requires the identification of development priorities for each province, district and local municipality, and the expression of development plans in a spatial layout. The latter in turn, has to be formalised in a detailed land use and management plan. Thus the key land-use decision-making is undertaken by the local municipalities, in this case the Matzikama Municipality. Their plans have to fit in with broader scale plans of the district and province and will need to take account of the land-use plan being prepared for land claimant community in terms of the settlement agreement of 2015 (Phulisani, in prep.).

The Western Cape Spatial Development Framework (SDF) highlights the conservation importance of the Olifants River Estuary at a national level but offers little of specific relevance to the management of the Olifants River Estuary. The district IDP and SDF advocate conservation of environment and natural resources as well as historical buildings and structures, but do not specifically mention the estuary. The Matzikama Municipality SDF acknowledges the importance of the estuary within the region but provides little specific guidance for the management thereof. However, there exists a Management Plan Guideline document (Urban Dynamics 1998) developed specifically for the lower Olifants River on behalf of the West Coast District Municipality as part of the original IDP development process. This document was designed to provide the framework for the IDP, and includes a management framework, zonation plan and guidelines for conservation and development of the estuary and surrounds. It proposes a biosphere reserve-type approach for the area, incorporating a small core conservation area surrounding the mouth of the estuary, a transition zone surrounding the Olifantsdrif settlement, and the remainder of the study area being proposed as buffer zone.

There is currently little development and use of the estuary margins, though there has been some loss of saltmarsh. Nevertheless, applications for development around the estuary margins have been made and are likely to increase in the future, bringing associated challenges for managing use of the estuary. Recreational use is relatively low except during the peak holidays season when informal camping takes place on the salt marsh area adjacent to Papendorp, but will probably increase, and will need to be managed to limit

disturbance. Key concerns are light aircraft, quad bikes, and speedboats, which cause disturbance to habitats and fauna.

The area falls within a strip of diamond mining concessions along the west coast, with offshore and terrestrial concessions straddling the estuary mouth area. These have been mined in the past and are not active at present. Any activity would have to be preceded by an environmental impact assessment and would require an environmental management plan. The salt pan has no significant impact on the estuary at the present time. However, reclaiming the salt pan as an artisanal enterprise is supported by estuary stakeholders. Of greater concern currently are exploratory prospecting and mining licence applications underway on the west bank of the estuary with the intention of mining mineral sands. The proposed mining area would overlap with large areas designated as Critical Biodiversity Area (CBA) in the Western Cape Biodiversity Framework and Matzikama SDF.

The Olifants River Estuary has also been identified as one in which there is a need for rehabilitation. In the case of the Olifants River Estuary, restoration of the estuary to a better state of health would be very straightforward, and would mainly entail (in order of priority):

5. Promote sustainable fishing practices and if required reduce fishing pressure on the estuary;
6. Restoration of the quantity of freshwater inflows;
7. Restoration of water quality; and
8. Removing the barrier effect of the Lutzville causeway.

Apart from the last-mentioned, these are all addressed in the management issues described above. Alteration of the Lutzville causeway is the lowest of these priorities and its worthiness would still need to be considered.

In general, the degree to which these factors should be managed to restore the health of the system depends largely on the vision that is developed for the estuary, and on its future protection status.

3 VISION & OBJECTIVES

A vision is a high level statement which defines the strategic intent of a management intervention. A draft vision was developed in the initial stages of the stakeholder consultation process. This vision was revised at a meeting of Olifants River Estuary stakeholders on 6 June 2011 (Minutes of the Estuary Interim Forum Meeting, 6 June 2011) and has been further refined at a meeting held in Cape Town with representatives of the fisher community, University of Cape Town (UCT) Environmental Evaluation Unit and Masifundise Development Trust in November 2013 .

The Olifants River Estuary is critically important for people and wildlife; it should bring economic benefits to the local community through sustainable use of natural resources and responsible ecotourism; it should protect the cultural heritage and practices of the local community and should benefit all South Africans through conservation of biodiversity and ecosystem functions.

The Olifants River Estuary will be managed using an Ecosystems Approach to Fisheries and a Human-rights Based Approach in line with the United Nations Convention on Biological Diversity Programme of Work on Protected Areas, the FAO Ecosystems Approach, the Draft International Guidelines on Small-scale Fisheries (2013, FAO) and the Policy on the Small-scale Fisheries Sector (2012, DEFF).

The key objectives for the Olifants River Estuary are all set out in the form of a circular diagram as all objectives are seen to reinforce all other objectives and none are seen as being of greater importance than any other. These are depicted in Figure 3.

3.1 Conserve biodiversity

Adequate protection must be provided for estuarine biota to ensure persistence of populations, species, habitats and ecosystem processes, living resources must be protected from overexploitation and excessive disturbance.

3.2 Improve local livelihoods

Efforts to improve beneficiation of harder catches should be explored. New (supplementary) livelihood opportunities and other benefits within the estuary must be identified and harnessed, particularly for the benefit of those that are negatively affected by declining fish stocks and changes in their availability in the estuary. Furthermore, identification and development of supplementary livelihoods especially for those dependent on resources for their livelihoods must be pursued by all partners.

3.3 Ensure co-operative governance

Harmonious and co-operative governance is achieved between the responsible management authority, relevant spheres of government, and the local community, such that the local community is capacitated to undertake co-management responsibilities of the estuary.

3.4 Maintain ecosystem health

The estuary should be maintained in a condition which is largely natural. This will require that it is improved from its current status as a C-class estuary (moderately modified) to a B-class estuary (largely natural).

3.5 Promote research and monitoring

Research and monitoring must be undertaken to produce appropriate and reliable quantitative data toward sustainable management of the estuary in respect to conservation, development, resource use and other activities.

3.6 Increase awareness

Residents and visitors should be aware of the importance and social, cultural and economic value of the estuary, know the regulations, and understand the rationale for management measures.

3.7 Maximise social, cultural and economic benefits

The estuary must be managed to maximize the value of ecosystem goods and services delivered in the long term, ensuring an equitable balance between local, regional and national benefits, whilst respecting and protecting the human rights and livelihood needs of the local community.



Figure 3: Key objectives to achieve the Vision for the Olifants River Estuary

4 MANAGEMENT OBJECTIVES AND ACTIONS

Each overarching, or key objective can be achieved through a number of detailed management objectives, and associated actions. The priority actions are collated in the respective action plans (See Section 6). The structure of the Olifants River EMP Management objectives required to achieve the main objectives are summarised in Figure 4, with associated indicators of performance described in Table 1. **The implementation of these actions will be tracked using the CapeNature Governance Tool.**

Maximising the social and economic benefits and improving local livelihoods will require the conservation of biodiversity and maintaining the local culture and sense of place as well as development and marketing initiatives. Conservation of biodiversity requires the introduction of a mosaic of measures to increase protection of the estuary. These will include the establishment of a community conservation area (CCA) at the mouth of the estuary that provides a sanctuary for all biota in the estuary that is broadly supported by all parties. It also requires sustainable use of the fish stocks. This necessitates a range of fisheries management measures including strengthening local fisher involvement in co-managing the resources, integrating local knowledge with scientific knowledge, improved compliance, increased local awareness about the value of different line fish species and the impact of by-catch, and increased and more effective community data monitoring. A key strategy is to introduce a multi-species, community-based approach that will enable some members of the local community to harvest other marine resources along the nearby coastline, in line with the new small-scale fishing policy. This will in turn reduce effort and pressure on the estuary. While it is noted that gill net fisheries operating in estuaries inhabited by juvenile marine fish species may impact negatively on the survival of both the estuarine dependant juvenile populations and the adult populations, it is also understood that the use of nets is a central component of the culture of the local community. Their basic human rights to food security, to their culture and their livelihood need to be balanced with the right to environment. Supplementary livelihood options will also come on stream with the finalisation of the community development plan associated with the land restitution processes and a focused strategy will aim to divert some of the younger fishers into new livelihood options that expand their potential to maximise eco-tourism opportunities in the area but minimise impact on the estuary. Reduction in effort is therefore a preferable alternative to phasing out the gillnet fishery as has been suggested in 2005 rights allocation process for net fisheries (DEAT: MCM, 2005), since this will also retain some of the livelihood benefits from the estuary, these will be sustained for longer, and the presence of the fishery can be a draw card for tourism. The introduction of a CCA will require a process of developing a zonation plan.

Economic and livelihood objectives require development and opportunities for ecotourism growth to provide supplementary and alternative livelihoods, but this will have to be subject to coastal management line(s) and development guidelines that safeguard the cultural heritage and sense of place of the estuary. To this end, the south bank should seek to retain a relatively underdeveloped nature and promote appropriate development (e.g. ecotourism) after a thorough consultation process is undertaken to consider the options available. The proposed CCA includes the salt marshes but does not include the Papendorp settlement or agricultural lands. These features will need to be integrated into regional and

local development plans. Ecotourism development will require training of local community members, marketing and attractive visitor facilities that draw people to the area.

Conservation of biodiversity will also require restoration and maintenance of ecosystem health through the provision of environmental flows, as well as rehabilitation of habitats that have been damaged, e.g. by mining activities. Biodiversity conservation will also be facilitated if public awareness is improved, which in turn will require the provision of educational material and signage. The management and monitoring of the estuary area, the freshwater inflows and development in the surrounding area will require cooperative governance among the RMA local and national government, catchment management agency, conservation agencies, and other relevant institutions. This in turn will require an Estuary Advisory Forum that has representation amongst all relevant organisations. The full and effective participation of the local communities in the forum will be critical for the success of these processes. As part of co-operative governance, the relevant government departments, authorities, and agencies will need to secure financing and ensure adequate resources and capacity within their institutions to undertake their responsibilities in accordance with their mandates.

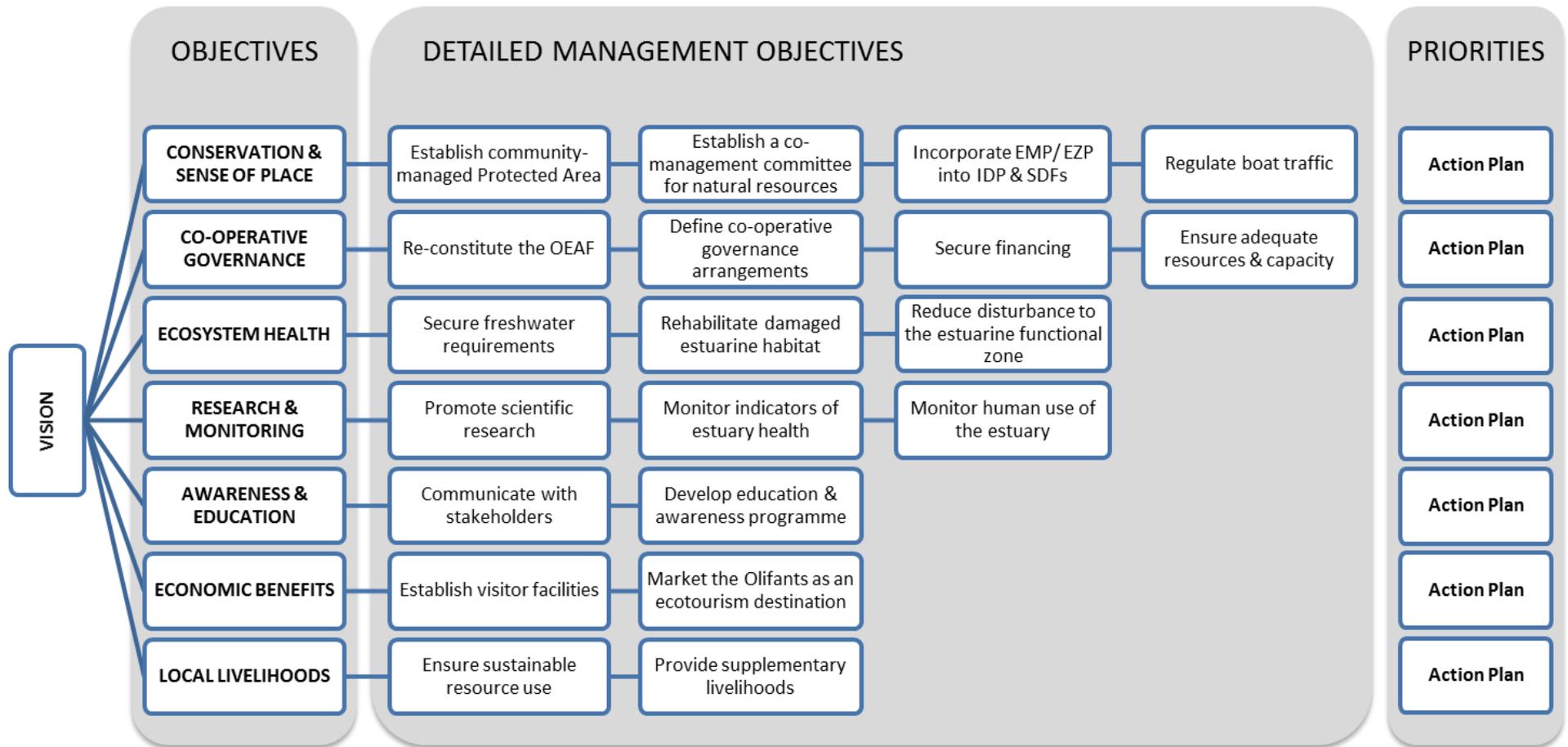


Figure 4: Structure of the Olifants EMP showing detailed Management Objectives to achieve key Objectives and the Vision

Table 1. Indicators for management objectives and actions

MANAGEMENT OBJECTIVE	INDICATORS
<p>1. Conservation of estuarine biodiversity & sense of place</p>	<ul style="list-style-type: none"> • Estuarine protected area established that provides sufficient protection for biota in the estuary, including invertebrates (bait), fish, vegetation and birds • Zonation plan for the estuary approved and implemented • Draft Small-scale Community Fisheries Management Plan developed for Ebenhaeser and Papendorp • Training and awareness-raising of local fishing community is undertaken • Increased monitoring of both small-scale and recreational fishing • Illegal fishing activities minimised • Boating activities are controlled • Olifants River Estuarine Management Plan integrated within local, district and provincial level planning documents (IDPs and SDFs) • Coastal management line is determined and gazetted • Future development on the estuary is constrained to ensure that it does not compromise estuary health, ecosystem functioning and/or sensitive species (e.g. no development in the 1:100 yr flood line) • Future development on the estuary is constrained to ensure that it does not compromise the existing rural atmosphere and cultural heritage resources associated with the Olifants River Estuary (SDF)
<p>2. Harmonious and effective co-governance</p>	<ul style="list-style-type: none"> • Olifants River Estuary Advisory Forum convened and meets regularly • Communal Property Association is capacitated and represented effectively on the Olifants River Estuary Advisory Forum • Arrangements for co-operative governance of the Olifants River Estuary defined and agreed to by all participating agencies and organisations • Finance required for implementation of the Olifants River Estuary EMP secured and available within/from relevant agencies • Adequate capacity and resources available for implementation of the EMP amongst participating agencies • Mechanism for documenting and integrating local traditional knowledge of fishers with that of scientists is established and regular monitoring and adaptive planning review meetings are held
<p>3. Restoration of estuary health</p>	<ul style="list-style-type: none"> • Freshwater environmental reserve for the Olifants River Estuary implemented • Quantity and quality of freshwater reaching the estuary is adequate to restore and maintain estuary health • Pollution from farmlands monitored and regulated • Improvements in ecological health indices indicating enhancements to biodiversity and ecosystem function • Detrimental mining activities are removed from the estuarine functional zone
<p>4. Research and monitoring</p>	<ul style="list-style-type: none"> • Adequate research and monitoring is being conducted that allows for quantification of utilisation patterns, changes in abiotic and biotic health, and benefits accruing to local communities and national economy • Training of community monitors to participate in environmental monitoring

5. Enhanced public awareness and appreciation for the Olifants River Estuary	<ul style="list-style-type: none"> • Functional and effective stakeholder communication, education and awareness programmes are in place • Stakeholders are sensitive to and aware of activities affecting health and functioning of the estuary, and management regulations governing use of the estuary
6. Enhance local livelihoods	<ul style="list-style-type: none"> • A sustainable local gillnet fishery is established • The economic and ecological feasibility of establishing a small scale mariculture operation is investigated and evaluated. • Supplementary livelihood opportunities are provided through ecotourism based economic development • The cultural and heritage rights of the Ebenhaeser community are recognised, protected and promoted by the government agencies involved, other stakeholders and visitors to the estuary
7. Maximise social, cultural and economic benefits delivered by the estuary	<ul style="list-style-type: none"> • Olifants River Estuary recognised as a nationally important ecotourism destination • Quality and quantity of visitor facilities (ablutions, parking, etc.) sufficient to meet visitor standards and requirements and these facilities are managed by the community • There has been a tangible and measurable improvement in benefits accruing to local communities surrounding the estuary • The unique cultural heritage value of the area is recognised, protected and promoted for the benefit of the local community and for future generations

5 SPATIAL ZONATION

5.1 Introduction

The Olifants River Estuary is among the top five estuaries in the country in terms of conservation importance, and is under consideration for being assigned Ramsar status as a wetland of international importance. The introduction of a range of measures to increase protection and sustainable use of the estuary will make an important contribution towards biodiversity conservation targets (Turpie & Clark 2007) as well as meeting policy decisions enshrined in the White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (1998) and commitments made at the World Summit on Sustainable Development, to increase the area under formal protection and ensure sustainable use of resources. Equally important will be to protect the rights and socio-economic needs of the local communities as required by the Convention of Biodiversity (1992), our Constitution and various other policies and laws such as the NEMA. Achieving this balance is critical for long-term sustainability of the estuary.

Currently, conservation in estuaries is achieved through a number of different legislative Acts including the MLRA, the ICM Act, the National Environmental Management: Protected Areas Act (Act No.57 of 2003)(NEM:PAA), and the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA). With the exception of the ICM Act, all of the acts listed above are able to provide explicit protection for living and non-living resources below the high-water mark only (viz. MLRA) or above the high water mark only (the rest). Maintenance of an adequate supply of freshwater to estuaries is provided for under the NWA. The latter Act also requires a specific water use licence for any development within the 1:100yr flood line. All development in this zone is actively discouraged. With the predicted changes in climate the possibility of increased flood events has been forecast.

The ICM Act provides for various levels of protection for both aquatic and terrestrial habitats in the coastal zone. The following are of importance and can be effectively used in the development of a zonation plan for the Olifants River Estuary:

1. **The Coastal Protection Zone (CPZ)** which comprises of the land 1 km inland from the high-water mark zoned for agricultural or undetermined use and the wetlands, lakes, lagoons or dams situated on this land; any land within 100 m inland of the high water mark in areas zoned for residential or commercial use; the seashore and admiralty reserves which are not coastal public property; and land inundated by 1:50 year floods or storm events). The Coastal Set-back / Management Lines for the West Coast District project (DEA&DP 2014) suggested that the 10m above mean sea level (amsl) contour around estuaries, along with any other protected or sensitive areas be designated as the CPZ.
2. **Coastal management lines (CML)** are designed to protect the integrity of the Coastal Protection Zone by imposing controls over development in ecologically sensitive or vulnerable areas and can be used to prohibit or restrict development seawards of a particular point. Draft coastal management lines for the West Coast District and Olifants River Estuary have been delineated and await formal adoption by Province and municipalities.

-
3. **Special management areas** are designed to provide additional protection for particularly special coastal ecosystems and biodiversity, and for control over exploitation of living and non-living resources in a particular area. In addition, they are also a mechanism that can be used to facilitate management by local communities and to protect local livelihoods.

5.2 Estuarine Boundaries

The ICM Act offers the greatest scope and flexibility within which a zonation plan for the Olifants River Estuary can be developed.

The ICM Act 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”.*

In terms of protection specifically afforded to each estuarine system through Resource Directed Measures, the Department of Water & Sanitation stipulates that the downstream boundary of an estuary is the estuary mouth; the upstream boundary is the full extent of tidal influence, saline intrusion, or backflooding; and the 5m amsl contour defines the lateral boundaries, where they have not been defined by scientific methods (DWA 2010).

The Estuarine Functional Zone, as delineated by a 5m amsl contour as proxy indicator, is defined by 2014 Environmental Impact Assessment Regulations (GNR 985) under NEMA (1998) 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...”. In this way, certain activities are not permitted within an estuary without prior Environmental Authorisation.

The geographical boundaries of the Olifants River Estuary are illustrated in Figure 5 (overleaf). Three reference boundaries are indicated:

- Demarcation of the estuary as per a 2011 SANBI demarcation based on a 5m amsl contour proxy
- Refinement of the 5m amsl contour proxy based on a high resolution lidar survey in 2014
- The CPZ, based on a 10m amsl contour (also derived from the 2014 lidar data) and buffer of 1000 m from the HWM

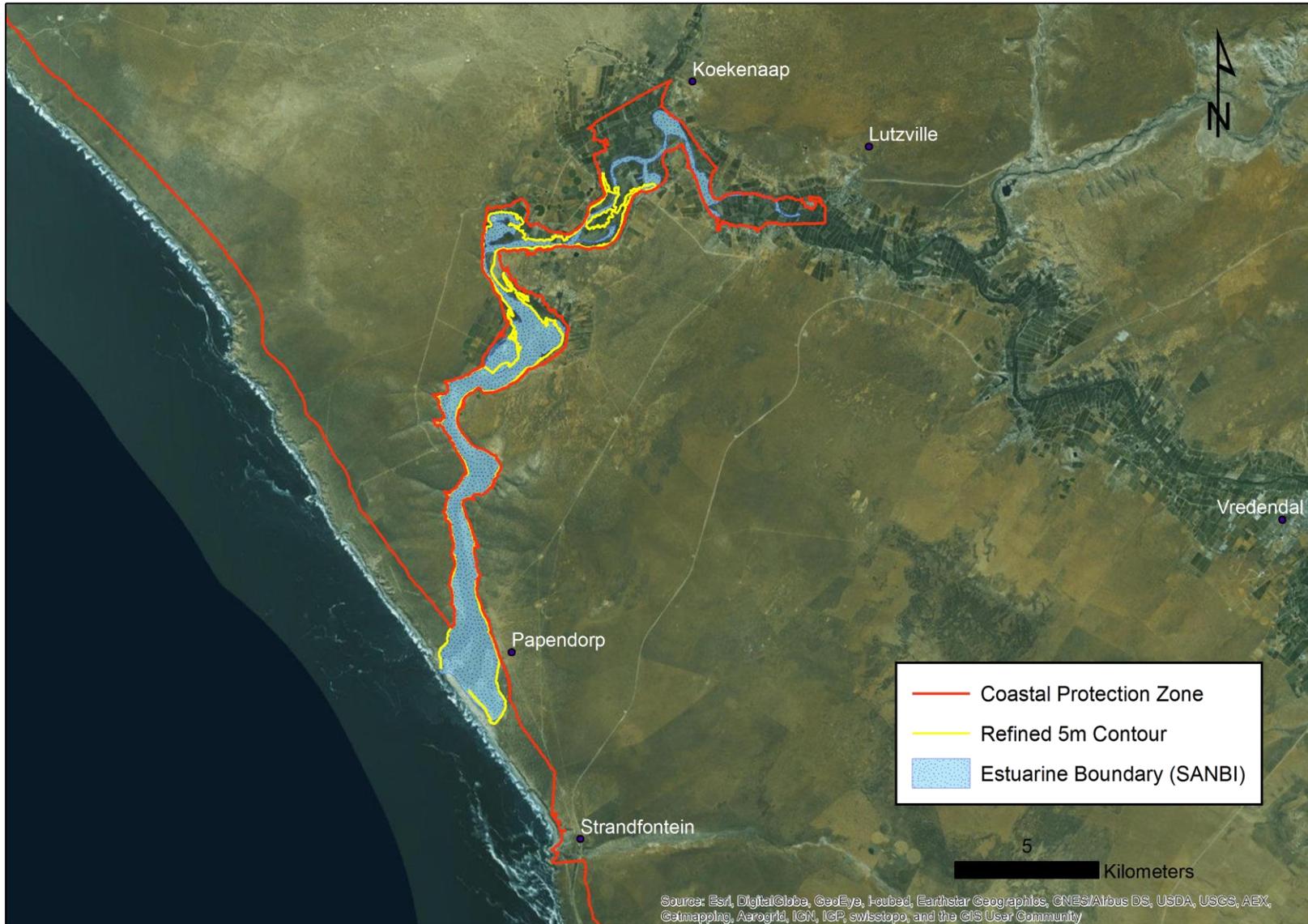


Figure 5: Geographical boundaries of the Olifants River Estuary, indicating the designated Coastal Protection Zone

5.3 Coastal Protection Zone and Coastal Management Lines

Under the ICM Act, the Provincial MEC in consultation with the Local Municipalities, is required to define a **CPZ** of at least 1 km from the coastal and estuarine high tide mark for all areas surrounding the Olifants River Estuary zoned agricultural or undetermined use and that are not part of a lawfully-established township, urban area or other human settlement, and a corresponding zone of 100 m for all other 'urban' land. The CPZ can be adjusted by the MEC.

The ICM Act also provides for the establishment of a **CML**, designed to protect the CPZ. Any future development within this zone would automatically be subject to an Environmental Impact Assessment and would have to be compatible with the revised vision and objectives defined within this management plan. Coastal management lines are thus a tool that can be used by managers and decision-makers to regulate and/or restrict certain development activities, protect sensitive ecosystems and important cultural areas and/or safeguard vulnerable properties. However, the determination of coastal management lines need to take account of several factors including the land-use plans and development proposals articulated in the CDLAP.

In the context of the Olifants River Estuary and all estuaries in the Western Cape, the CPZ functionally approximates to the 10m amsl contour and the CML to the 5m amsl contour, as per draft delineations adopted in the Coastal Set-back / Management Lines for the West Coast District project (DEA&DP 2014) (as illustrated in Figure 5 above).

It should be noted that agricultural activities on all land between the Olifants River Estuary and the irrigation canal (i.e. as far downstream as Big River Bend - Zoutpansheuwel) are designated exempt from the requirements of existing legislation whereby application has to be made for land clearance activities in terms of CARA and NEMA. Whether this exemption extends to development other than land clearance is not clear.

In its lower reaches (below the Ebenhaesar settlement), the Olifants River Estuary channel passes through a fairly steep sided gorge which is likely to be completely inundated during large flood events. Much of the supratidal saltmarsh surrounding the Olifants River Estuary (a nationally rare vegetation community type) occurs adjacent to the estuary channel immediately above and below this gorge area. Existing development in the lower reaches is mostly confined to the east bank at present and includes the Papendorp and Viswater settlements. Visitor access to the estuary also occurs mostly from the east bank through these two settlements. For these reasons, development would be considered undesirable on the east bank of the estuary up to the 20m contour (which more or less follows the top of the gorge from the mouth to the upstream boundary of the Farm Zoutpansheuwel). Above this point the estuary banks become much less steep and agriculture and development tends to encroach much closer to the estuary channel, with much of the area within the 1km buffer being under cultivation. This proposal needs to be discussed with the land claimant community as part of the land restitution and land use settlement planning processes.

On the west bank, consideration should be given to delineating the CML some considerable distance back from the estuary, corresponding in fact to the height of the ridge above this

bank, at least up as far as the upstream boundary of Erf 616. The purpose of maintaining such a conservative development management line is to preserve views from the east bank and hence maintain the current sense of place. This proposal conforms to recommendations provided in the 1998 Management Plan Guideline document (Urban Dynamics 1998) prepared for the lower Olifants River as part of the West Coast District Municipality's IDP development process. However, these management line proposals will need to be confirmed as part of a consultative process.

The land incorporated in this area includes:

- Farm 267/2 "The Point" (Olifantsmondbellegings Pty Ltd)
- Portion of Farm 267 The Point (De Punt Plase Pty Ltd), west of a line extending from the southern-most coastal point of the farm north through height beacons 154 and 19 (Olifantshoogte) to the northern (boundary of the property).

While it is recommended that no development be allowed on the west bank, limited development nodes should be identified on the east bank which take account of development proposals in the CDLAP and provide development for existing communities without compromising livelihoods, cultural heritage and sense of place, and provide low density ecotourism opportunities. No development should take place within the 1:100yr flood line.

These proposals should be taken into account in the management line determination process. The provincial authority should be required to engage with landowners, the land claimant community and their relevant structures as well as members of the Estuary Advisory Forum.

5.4 Olifants River Estuary Community Conservation Area

In addition to adopting the extent of the CPZ and delineating the coastal management line around the Olifants River Estuary, it has been proposed that a portion of the lower estuary, at the mouth of the estuary be demarcated as a **protected area** in terms of legal mechanisms available in Acts such as NEMA:PAA and/or a **Special Management Area (SMA)** in terms of the ICM Act. This currently conceived as a Community Conservation Area (CCA) by local stakeholders.

This CCA would be zoned as a **no-take fishing area** and would restrict certain activities and use of mechanised vessels. Zonation will allow for partitioning of activities within the estuary, thus permitting their co-existence without one activity precluding or conflicting with another. However, the traditional fishing activities of the local communities will need to be considered in this zonation process. **This zonation plan will need to align with the fisheries management plan that will be prepared in terms of the new Small-scale Fishing Policy.** Such a zonation plan will also reduce management costs as it will focus activities in particular geographic areas and hence eliminate the need to deploy management staff across the whole estuary at all times.

The proposed CCA extends from the mouth up to approximately one km upstream and ideally would include the banks of the estuary where sensitive and conservation worthy

estuarine vegetation occurs (i.e. from the middle of the estuary channel up to the top of the supratidal salt marsh on the west bank of the estuary) (Figure 6). This area is proposed as a bait (invertebrate) and water bird sanctuary. Collection of bait species (invertebrates) will not be permitted in this area, and disturbance to avifauna will be minimised through a minimum height restriction for aircraft (minimum altitude 1 500 m), and a ban on the use of motorised transport (off-road recreational vehicles, motor cycles and quad bikes). Pedestrian access will be restricted to established paths and board walks only. The historic ban on gill netting in this area will remain in force. This section of the estuary is home to the largest concentrations of waterbirds in the estuary (e.g. flamingos, pelicans, waders), which are easily, albeit unintentionally, disturbed by human activity (particularly bait collecting). Establishment of bird hides in this area will strongly promote ecotourism (birdwatching), without seriously compromising access to bait resources for anglers.

Restricting the use of petrol or diesel boat engines to management and research use only, which has long been a tradition on this estuary, will also minimise disturbance to wildlife and the wilderness atmosphere on the system without overly restricting ability of visitors to enjoy the benefits thereof. It may be necessary, though, to provide exemptions for certain uses, provided these are kept to a minimum and are properly motivated (e.g. management and enforcement, tourism operators).

Aquaculture is not catered for within the zonation plan as the fluctuating salinities and high nutrient content of the system render it unsuitable for any aquaculture ventures. Land-based aquaculture could thus be considered in preference to in-stream aquaculture. However, the development of such an industry would need consultation with and approval by stakeholders.

Prospecting and mining may not take place in the CCA, and any mining related activities on properties partially or fully included in the CCA, or adjacent to the CCA, must recognise the sensitivity and overall conservation objectives of the community.

An inclusive, consultative process of refining a zonation plan, indicating the protected area, and activities appropriate in different zones, needs to be undertaken.

Once such a zonation plan has been developed and formally adopted, the boundaries between zones will be clearly demarcated on the ground with beacons and signage, indicating what restrictions are in force in each zone of the estuary.

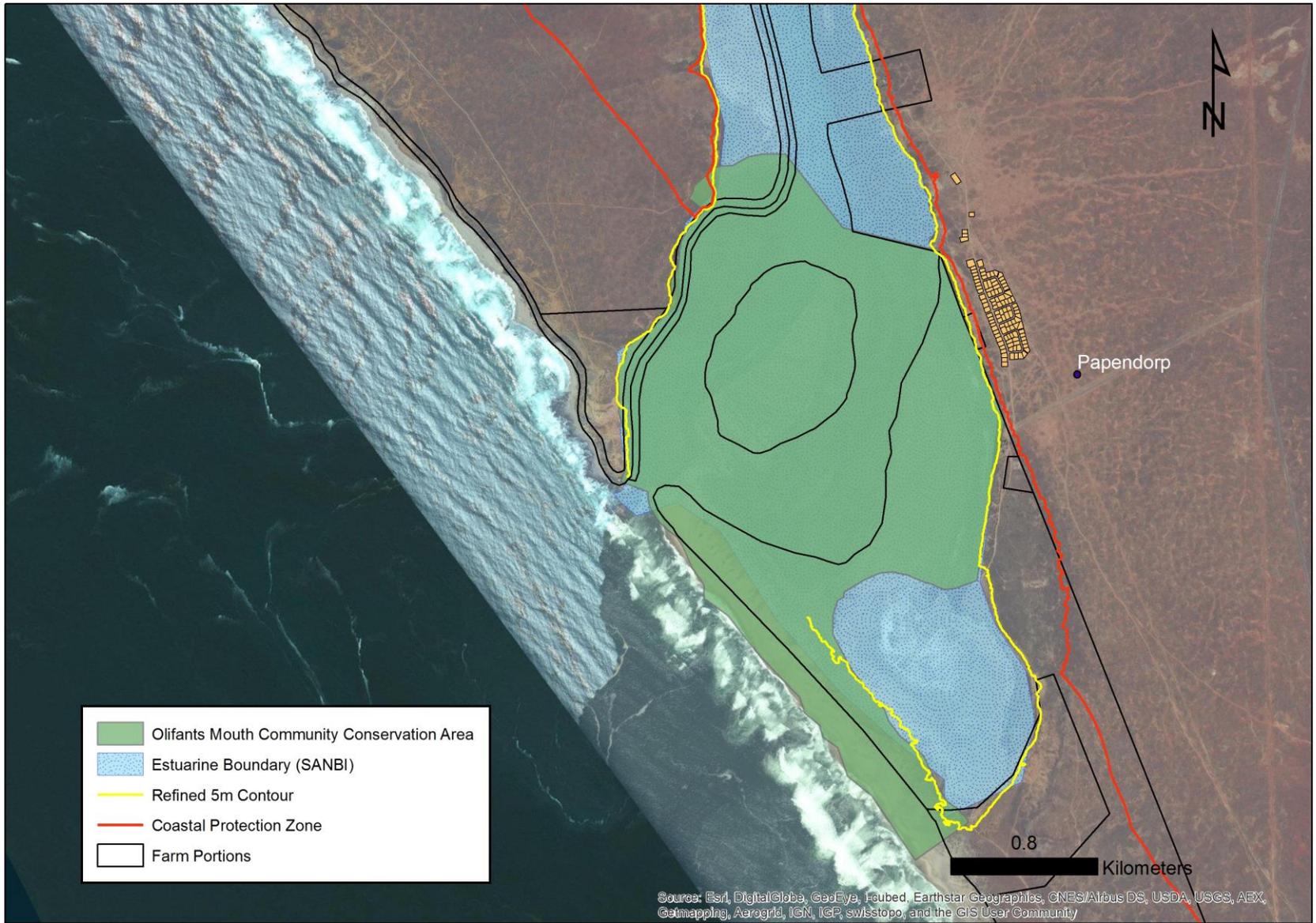


Figure 6: Location of the proposed Olifants River Estuary CCA

5.5 Potential for a terrestrial protected area

Ownership of much of the land surrounding the Olifants River Estuary is vested with the Ebenhaesar and Papendorp Communal Property Association (CPA). Generally, the community has rallied around the idea of a community managed/owned conservation area in the Olifants River mouth. This area will serve to retain the wilderness character of the estuary and enhance its ecotourism appeal, and may thus generate greater income for the community than simply using it for grazing or agriculture.

The exact mechanisms for awarding the conservation status, as well as the final boundaries of the conservation area still need to be confirmed. In addition, management plans would be required for the surrounding areas, especially taking into account property boundaries and factors such as priority areas for protection of terrestrial vegetation types. It would also need to take account of land-use proposals in any forthcoming development plans for the area.

The potential also exists to establish a conservancy or stewardship agreement linking the estuarine protected area to the proposed Namaqualand National Park to the north. This land is largely owned by mining companies and not intensively utilised at present, but is coming under increased pressure from mining interests.

6 MANAGEMENT PRIORITIES

6.1 Protection of biodiversity and wilderness character

A range of measures are proposed to protect and promote the biodiversity of the estuary.

6.1.1 Establishment of a Community Conservation Area

The EMP makes provision for the establishment of a new, community-managed conservation area on the lower reaches of the Olifants River Estuary. It is proposed that the conservation area be zoned to allow for protection of key elements of biodiversity on the estuary (particularly waterbirds) as well as stocks of exploited species (currently for invertebrates only – i.e. bait species), to enhance the ecotourism potential of the estuary, and to maximise educational opportunities and prospects for scientific research. No fishing will be allowed in this zone. The area will be managed by the community in partnership with DEFF and DEA and with support from CapeNature. This conservation area has been identified as a key component of the Western Cape Protected Area Expansion Strategy.

CapeNature will also provide training and mentoring to the community members. Limited career opportunities will be created through the involvement of local community members in this protected area.

6.1.2 Adoption of an integrated fisheries management plan

The EMP will adopt an integrated fisheries management plan with the goals of maximising biodiversity protection of marine and estuarine resources and securing sustainable use of these resources. This plan comprises a range of measures aimed at achieving these goals. These include:

- *Governance: Integrated, community-based governance of the fisheries through the establishment of a community-based legal entity. Full and effective representation of this entity in the Olifants River Estuary (Advisory) Forum (OEAF).*
- *The development of an integrated plan that aims to link the estuary fishery to the nearby coastal small-scale fishery, thereby re-introducing a multi-species, seasonally sensitive fishery that will reduce overall effort on the estuary.*
- *Introduction of an integrated, adaptive learning approach to fisheries management with regular management reviews as well as the introduction of mechanisms to integrate local knowledge with scientific knowledge.*
- *The introduction of improved boat registration, boat tracing and control mechanisms on the estuary.*
- *Reduced pressure on the estuary: A range of measures will be introduced to reduce the effort and pressure on the estuarine fishery. These will centre on the coupling of the fishery to the small-scale near-shore fishery along the coast, thereby enabling some of the fishers to re-locate their effort. The illegal fishery on the estuary will be tightly monitored and permit conditions enforced. Supplementary and alternative livelihoods will be secured for those new entrants without permits.*
- *Improved compliance through fishers' participation in management decisions including determining rules and permit conditions for the fishery.*

-
- *Increase and improved monitoring through the involvement of the local community, integration of their knowledge, training and capacity building.*
 - *Stricter monitoring of the recreational fishery will be introduced with the option of considering additional restrictions on this fishery in future.*

The support of the DFFE and CapeNature for this integrated fisheries plan is critical. Most notably, the support of DFFE in assisting the community in the development of this plan as part of the implementation of the Small-Scale Fishing Policy is critical. Of further importance, is that the provincial and municipal planning documents (SDFs and IDPs) embrace and support the objectives of this EMP. Further discussion on the proposed coastal management line with the claimant community, other land owners and interested and affected parties will be necessary now that the settlement agreement has been concluded and the CDLAP finalised. It is desirable that planning documents ensure that the style and density of development around the estuary does not compromise the sense of place, and limits development to one bank of the estuary only such that views from the opposite bank retain their natural vista.

Table 2. Management actions for conservation of biodiversity and wilderness character

Management Objective	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated Budget
a. Establish a Community-managed Protected Area on the lower Olifants River Estuary (from the mouth to 1 km upstream, the lateral boundaries being the landward extent of estuarine saltmarsh vegetation) gazetted in terms of either the NEM PAA or SMA in terms of ICM Act 2008.	i. OEAF, WCDM, and Cape Nature to draft and submit request to the Minister, DEA and DEFF, to establish a Protected Area in the Olifants River Estuary that includes a sanctuary zone and a controlled use zone in the remainder of the estuary.	ICM Act 2008 NEM:PAA	<ul style="list-style-type: none"> Joint memorandum from RMA, OEAF, WCDM to Minister DEA requesting proclamation of a new PA on the Olifants River Estuary Proclamation notice in government gazette 		CapeNature OEAF WCDM DFFE	
b. Facilitate the establishment of a functional co-management committee for natural resources	i. DFFE & CapeNature to assist community in establishing a legal entity linked to small scale fisheries policy.		<ul style="list-style-type: none"> Co management committee established Minutes of meetings 		DFFE	
	ii. DFFE to support local entity in developing an integrated, community based fisheries management plan		<ul style="list-style-type: none"> Small-scale community fisheries management plan developed Illegal fishing activities minimised 		CapeNature OEAF	
c. Integrate Olifants River Estuarine Management plan into development planning	i. Ensure that there is synergy between the OEMP, and other planning tools such as the IDPs and SDFs	ICM Act 2008 Municipal Systems Act 2000	<ul style="list-style-type: none"> SDFs and IDPs reflect requirements of Estuarine Management Plan CML determined and gazetted 		RMA Matzikama Municipality WCDM	
	ii. OEAF to work closely with Province and stakeholders in the coastal management line determination process					
	iii. Apply for legal status of the coastal management line under the Integrated Coastal Management Act					

<p>d. Regulate boat traffic on the estuary to minimise impacts on biodiversity, enhance safety, reduce pollution and nuisance value</p>	<p>i. West Coast District Municipality or Matizikamma Local Municipality to publish regulations requiring permits for using a boat on the Olifants River Estuary and banning the use of outboard motors other than electric motors for all purposes other than research and management</p>	<p>ICM Act 2008 Sea Shore Act 1935 Municipal Systems Act 2000</p>	<ul style="list-style-type: none"> • Regulations/Bylaws • Launch site application(s) • Launch site register 		<p>CapeNature Matzikama Municipality or WCDM OEF</p>	
	<p>ii. OEF to identify a short list of desired legal launch sites on the estuary and with assistance from the designated RMA to apply to DEA&DP to register these sites</p>					<p>DEA&DP</p>

6.2 Co-operative and effective management

A number of important steps must still be taken to ensure effective implementation of this management plan. Landowners, stakeholders and management agencies will need to work together in developing appropriate structures and processes that will provide for mutually satisfying and effective management of the estuary in the future. One of the most important of these is the establishment of the OEAF which will serve to ensure that channels of communication between stakeholders and management agencies are kept open and that issues and concerns raised by local communities and other stakeholders in the future can be addressed in an efficient and effective manner.

The responsible management authority for the Olifants River Estuary, as stipulated in the Protocol (2013), is the **CapeNature**. The first task of the **RMA** therefore will be to meet with the municipality and other departments to discuss their mandate and respective roles and responsibilities. For example, DFFE has jurisdiction over living resources in the estuary, DWS has jurisdiction of freshwater flows to the estuary, and the WCDM and Matzikama municipalities has jurisdiction over land-use around the estuary and recreational use of the estuary. CapeNature is responsible for management of, or support to, any conservation areas, and for enforcing the MLRA in their protected areas. The newly formed CPA that will be the legal holder of all claimed land and the Development Trust which will be responsible for execution and administration of a detailed land use plan (still to be finalised) will also be key institutions in decision-making and collaborative governance arrangements. Capacity (human, infrastructure and financial resources) available within the various government agencies for management of the Olifants River Estuary is currently limited and will need to be bolstered. It is essential that all of these agencies work cooperatively with local stakeholders to ensure the vision and defined management objectives can be realised.

The effective governance of the estuary will require suitably-trained staff and adequate equipment, all of which require adequate start-up funding as well as on-going funds for management. **The CapeNature Governance Tool will be used to identify, monitor, track, and report on the implementation of management objectives.**

Table 3. Management actions for co-management and effective governance

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Reconstitute the Olifants River Estuary Advisory Forum (OEF)	i. Invite representative members of the local community and other stakeholders and government to be members of the OEF	ICM Act (2008)	<ul style="list-style-type: none"> A list of members of the forum and their contact details 	2016	CapeNature	
b. Define co-operative governance arrangements for management of the proposed Olifants River Estuary Protected Area	i. RMA to meet OEF and to define clear roles and responsibilities for the authority, the OEF and the other participating agencies, including management of the Olifants River Estuary CCA.	ICM Act (2008) NEM:PAA (2003)	<ul style="list-style-type: none"> Proceedings Roles and responsibilities of different governance actors agreed upon and documented 	2016	RMA	
	ii. The RAM and OEF need to engage with newly formed CPA and Development Trust associated with land claim				OEF	
	iii. RAM and OEF to obtain agreement from the other participating agencies in respect of their roles and responsibilities.		Matzikama Municipality			
c. Secure financing	i. Secure start-up financing for estuary management, capacity building and research and monitoring programmes	ICM Act 2008 NWA 1998 CARA 1983 Municipal Systems Act 2000 SSFP 2012	<ul style="list-style-type: none"> Signed letters from all agencies to be involved with the management of the Olifants River Estuary PA and the OEF clearly outlining respective roles and responsibilities 	2016	DFFE	
	ii. Lobby respective agencies to allocate resources, create and fill posts, and acquire necessary infrastructure and resources				DWS	
					DEA&DP	
					CPA	
					CapeNature	
					Matzikama Municipality; and key partners	

	iii. Develop a long-term financing plan				CPA	
d. Adequate resources and capacity	i. Establish an office at the estuary, preferably at Viswater/Papendorp		<ul style="list-style-type: none"> • Office building 		CapeNature Matzikama Municipality and key partners	
	ii. Acquire necessary equipment (office equip, water quality meter, boat, vehicle)		<ul style="list-style-type: none"> • Office is adequately equipped 			
	iii. Recruit estuary manager and two field rangers as permanent staff. Preference needs to be given to training up field officers from within the Ebenhaeser community		<ul style="list-style-type: none"> • Staff & resources deployed for management of Olifants River Estuary in terms of the OEMP 			
	iv. Identify and address training needs among management staff and staff (involved in estuary) of CapeNature, Matzikama Municipality and DEFF and DEA as well as local community conservators (e.g. for monitoring, visitor regulation and assistance)		<ul style="list-style-type: none"> • Training records 			
	v. Evaluate performance of staff, contractors and volunteers		<ul style="list-style-type: none"> • Performance evaluations 			

6.3 Restoring estuary health

Three focal areas have been identified for restoration or rehabilitation on the Olifants River Estuary.

The first relates to quantity and quality of freshwater flow reaching the estuary and the second to historic diamond mining operations on the estuary. The estuary currently receives some 69% of the natural mean annual runoff (MAR). While this does not affect mouth condition, since the Olifants has not so far shown evidence of being sensitive to closure due to its rocky sill at the mouth, reduction in flow has had a considerable impact on water quality, both due to reduced ability to dilute pollution and due to the increase in polluted return flows as a result of use of the water in irrigation. The reduced flows have also altered the physical habitat of the estuary in that the depth and profile has changed. The reduction in flows has also resulted in considerable changes to the biota of the estuary. Primary productivity by microalgae is thought to have increased due to the nutrient input and reduction in flushing of the estuary. Plants have also been significantly affected. The stagnation and enrichment of water in the upper reaches of the estuary has led to an increase in the biomass and extent of *Potamogeton pectinatus* and macroalgae. The distribution of brackish reeds and sedges has probably diminished as a result of increased salinity. The biomass of zooplankton and bottom-living invertebrates such as amphipods and prawns is likely to have increased as a result of the increase in salinity. The fish community composition is thought to have changed radically as a result of changes in salinity. Numbers of estuarine round herring and flathead mullet as well as indigenous freshwater species have decreased, but harders are thought to be more abundant now than in the past, although this may not be evident due to high fishing pressure at present. Changes in the bird community have probably been only slight, with species associated with fresher conditions becoming less common on the estuary. A recently completed ecological reserve determination study has recommended that summer freshwater flows to the estuary be boosted to alleviate the impacts described above, but must still be signed off by the Minister of DWS, before it can be implemented.

Prospecting trenches excavated along the west bank of the Olifants River estuary are also an issue of concern as these have developed into erosion gully that carry large volumes of silt into the estuary and are destabilising the banks in places. These trenches are also very unsightly and need to be stabilised, refilled and re-vegetated.

Mining operations along the coast (including sand, diamond, and heavy minerals) pose a significant threat to the ecological integrity of the Olifants River estuary. It is undeniable that mining results in adverse and mostly irreversible loss of biodiversity and modification of natural processes, and would therefore be in direct opposition to the notion of incorporating the estuary in a protected area. Given the biodiversity conservation importance of the Olifants River estuary as the fourth most important estuary in South Africa and a critical estuarine resource on the West Coast, all existing mining activities within the estuarine functional zone should be phased out and ultimately no further mining activities should be allowed to take place. Evidently, there are conflicting issues relating mining rights, local livelihoods, and establishing a conservation area, which need to be sensitively resolved.

Table 4. Management actions for restoring estuary health

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Secure adequate quantity and quality of freshwater input to restore and maintain ecosystem health and functioning	i. Lobby minister DWS to sign off the recommended freshwater reserve for the estuary	National Water Act 1998	<ul style="list-style-type: none"> Improvements in ecological health indices 	2016	DWS CapeNature DEA	
b. Rehabilitate estuarine habitat damaged by historic mining operations	i. Identify companies responsible for existing mining damages to the estuary banks and lobby for rehabilitation of damage inflicted by historic diamond mining operations on the estuary	Minerals and Petroleum Resources Development Act (MPRDA) 2002	<ul style="list-style-type: none"> Improvements in ecological health and aesthetic indices 	2016	CapeNature Matzikama Municipality DFFE:WfW	
c. Reduce disturbance to the estuarine functional zone	i. Undertake a Mining Risk Assessment to evaluate highly sensitive areas in the EFZ and the impacts of all forms of mining, (past, present and future)	MPRDA 2002 ICM Act 2008 NWA 1998	<ul style="list-style-type: none"> Knowledge of mining impacts Identification of highly sensitive areas 	2016	Matzikama Municipality CapeNature	
	ii. Negotiate and develop a process of retreat for mining activities within sensitive areas, inclusive of rehabilitation requirements.	NEM:BA ICM Act NEMA MPRDA 2002	<ul style="list-style-type: none"> Retreat of mining activities Exclusion of mining activities in sensitive areas Improvements in ecological health and aesthetic indices 	2018	Matzikama Municipality CapeNature DFFE DMR	

6.4 Research and monitoring

This management plan has been devised based on current understanding of the functioning of the estuary and its economic value. There are gaps in this understanding, and there will be an on-going need to improve understanding through research.

Increasing use by visitors, surrounding development, fishing activities, changes in freshwater supply from the catchment, and climate and sea-level change can impact on the health and ecological functioning of the estuary, as well as its value at different spatial scales.

Monitoring and research are essential to enable the respective agencies responsible for management of the Olifants River Estuary to adapt management plans, operational plans and activities to changing circumstances. Four key focal areas for monitoring and research associated with the Olifants River Estuary include the local fishery, visitor numbers and behaviour, water quantity and quality, physical characteristics, nutrients, biodiversity, and populations of exploited species. All ecological monitoring must be done in alignment with the reserve determination methodologies prescribed (see below). It is imperative that mechanisms for integrating the local knowledge of the fishing community into on-going research processes are developed.

The reserve determination study for the Olifants River Estuary has recommended that flows released from the Clanwilliam Dam be improved in order to restore the health of this nationally important estuary. While these recommendations have yet to be adopted by DWS, proper assessment of the efficacy of these interventions requires detailed baseline information from before and after implementation. Recommended protocols for monitoring the implementation of the freshwater reserve for the Olifants River Estuary have been prepared by Taljaard *et al.* (2006) and are included in Appendix 1. These protocols serve to monitor the health of the estuary. Related to this, the “Ecological Specifications” and “Thresholds of Potential Concern” (TPC) for the Olifants River Estuary are included as Appendix 2.

Similarly, impacts of gill net and recreational fishing in the estuary in accordance with the proposed management plan, on target and bycatch species needs to be monitored. In addition, the socio-economic circumstances of the fishers that rely on the estuary for food and livelihoods needs to be carefully monitored to ensure desired results are achieved and ancillary impacts are not overly severe. In addition, it will be advisable to monitor visitor numbers, profiles, behaviour and opinions. It is recommended that these protocols be adopted as a monitoring programme for the proposed Olifants River Estuary Special Management Area.

Table 5. Management actions for research and monitoring

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Promote scientific research	i. Identify information gaps and develop research programme(s) aimed at gathering/ consolidating data on biodiversity and exploited species		<ul style="list-style-type: none"> • Research projects • Scientific reports, paper and publications 	2017-19	Matzikama Municipality CapeNature Dept of Science & Technology OEAF	
	ii. Engage local research institutes and universities and local community members to collaborate on priority research projects					
	iii. Solicit research funding support					
b. Monitor biophysical indicators of estuary health	i. Carry out monitoring programme as outlined in Appendix 1 and assess results in terms of thresholds of potential concern (Appendix 2)	National Water Act 1998	<ul style="list-style-type: none"> • Monitoring data and reports 	2017	CapeNature DWS Matzikama Municipality	
	ii. Undertake training of community monitors to participate in environmental monitoring		<ul style="list-style-type: none"> • Local community trained and involved 	2017		
c. Monitor human use of the estuary	i. Carry out monitoring programme as outlined in Appendix 1	National Water Act 1998 as well as socio-economic well being	<ul style="list-style-type: none"> • Monitoring data and reports 	2016 - 19	CapeNature Matzikama Municipality	
	ii. Undertake training of community monitors to participate in environmental monitoring		<ul style="list-style-type: none"> • Local community trained and involved 			

6.5 Increasing public awareness and education

Effective management of the estuary will be dependent on stakeholder buy-in (through adequate consultation and communication) and visitors' appreciation of the local management regulations. Education is also considered to be among the most important functions provided by a protected area along with biodiversity conservation, maintenance of population of exploited species and the protection of cultural heritage in situ. Protected areas provide opportunities where the public are able to view species in their natural environments, to experience ecosystems in a largely undisturbed state and to learn to appreciate cultural heritage. Provision of interpretive and educational material at these sites can greatly enhance this experience as it focuses attention of visitors on goods and services provided by the environment of which they may not have been aware, highlights key aspects of the socio-ecological system that are special or unique to the area, and can be used to highlight the impact of human activities on the environment. Furthermore, the better people understand the issues surrounding the management of a protected area, the more they are likely to respect the management requirements and regulations. Thus the Management agencies for the Olifants River Estuary Protected Area will need to provide state of the art service in this field.

Furthermore, in view of the fact that people of Ebenhaeser are now the owners of a large tract of land adjacent to estuary, it is imperative that resources be allocated to capacity development and skills training of local institutions and people so that they can be involved in management and stewardship of the estuary. Local community members need to be trained and involved in the monitoring activities identified above and those with an interest in nature conservation should be trained to become field officers.

Table 6. Management actions for increasing public awareness and education

Management Objective	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Create effective mechanisms for on-going communication with stakeholders	Develop an effective communication strategy	ICM Act (2008)	<ul style="list-style-type: none"> • Effect communication strategy in place • Stakeholder database • Record of communications 	2016-17	CapeNature Matzikama Municipality OEAF	
	Maintain stakeholder database					
	Explore alternative communications mechanisms (workshops, signage, radio etc.)					
b. Develop an effective education and awareness programme for the protected area that enhances visitor experiences and facilitates compliance with regulations	Establish a visitor centre within the estuary protected area which acts as a focal point where visitors can go to learn more about the estuary, its conservation importance, the ecology of the system, the cultural and archaeological significance of the area and its people, and the need for rationale behind existing management interventions	ICM Act (2008)	<ul style="list-style-type: none"> • Education & awareness programme developed • Visitor centre open to public • Posters, pamphlets, signage, literature • Reports • Signage • Number of visiting groups 	2016-17	CapeNature Matzikama Municipality OEAF	
	Source and/ or commission educational and informative material including signage, posters, pamphlets, and relevant literature to be housed in the visitor centre and other appropriate localities that will enhance visitor experiences					
	Encourage field excursions to the estuary by local schools, community groups, and other stakeholder groupings					
	Erect signage at the main access points to the estuary and on the banks of the estuary between zones that depict the zonation plan for the system and provide information on regulations applicable within each zone					

6.6 Maximising economic benefits through ecotourism

The Olifants River Estuary is one of the most scenic and least developed of the large permanently-open estuaries in South Africa. It is widely referred to as being 'the jewel of the West Coast'. The primary challenge facing the future management Authority of the estuary is to provide a quality experience for visitors to the estuary while at the same time managing visitors in a manner that ensures that they do not compromise the resource that attracted them in the first place.

6.7 Improving local livelihoods

In order to achieve both the conservation of biodiversity and contribute to sustainable livelihoods, benefits derived from the estuary will need to flow to local communities. Direct tangible benefits must accrue to the surrounding communities as a result of the establishment of the Olifants River Estuary Protected Area which will compensate for any real or perceived lost opportunities or benefits arising from the establishment of this protected area. The community must be directly involved in the management of this area. The management partnership must take clear decisive steps to identify and facilitate the delivery of benefits to adjacent and broader communities. Such benefits could include community access to facilities and opportunities (educational, recreational use, and economic opportunities) and cultural interpretation, and must be communicated to local stakeholders in a clear and unambiguous way. Development of ecotourism projects linked to the natural environment and cultural heritage of the area could further contribute to improving local livelihoods. Delivery of direct benefits must focus on gill net fishers that may be negatively affected by the reduction in the extent of their fishing area.

Table 7. Management actions for maximising economic benefits

Management Objectives	Management Action	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Establish and manage visitor facilities	i. Develop appropriate nature friendly infrastructure for visitors to the estuary including accommodation (e.g. camping facilities, lodges, guest houses such as the disused guesthouse at Papendorp) as well as other facilities (roads, boat launching facilities, bird hides, walking paths, nature trails, mountain bike trails) in collaboration with local communities and independent contractors that does not detract from sense of place of the area or impact on the environment		Visitor infrastructure and facilities	2017-19	CapeNature Matzikama Municipality	
	ii. Facilitate opportunities for commercial operators and local communities to develop visitor facilities and provide services in the EPA		Number of tourism businesses increases Number of employment opportunities			
	iii Ensure that visitor facilities are maintained in good condition at all times to maximise visitor experiences		Facilities receive good reviews			
b. Market the Olifants River Estuary Protected Area as a wilderness and nature based ecotourism destination	i. Develop and distribute promotional material for the Olifants River Estuary SMA to key national, provincial and local tourism agencies and info centres		Brochures, pamphlets, magazine articles, website and road signage	2017-19	CapeNature Matzikama Municipality OEAF	
	ii. Develop a website					
	iii. Lobby relevant agencies to ensure the estuary is featured in local, regional and national tourism marketing and included on tourism routes					
	iv. Petition national road agencies to erect appropriate road signage informing passing visitors and tourists of the existence of the EPA					

Table 8. Management actions for enhancing local livelihoods

Management Objectives	Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)	Estimated budget
a. Sustainable use of estuary resources	i. Establish the number of gillnet fishing rights on the estuary that can be sustained with adequate no-take protection of part of the estuary as defined in this management plan	MLRA (1998) SSFP (2012)	Recommended number of permits based on adequate research	2016-17	DFFE, RMA	
	ii. Issue gill-net fishing rights to bona fide fishers		Gill net rights issued			
	iii. Develop an integrated fisheries management plan that includes the estuary and the near-shore zone and manages effort across this integrated zone.		Integrated fisheries management plan developed	2019	DFFE, RMA	
	iv. Assess economic and ecological feasibility of establishing a small scale mariculture operation on the estuary		Economic and ecological feasibility report	2016-17	Matzikama Municipality, RMA	
	v. Enforce legislation for fishing and bait harvesting through compliance monitoring		Increase in number of patrols & inspections Number of infringements reduced		DFFE CapeNature	
b. Provide supplementary livelihoods	i. Promote economic development in the local area that provides employment opportunities and reduces reliance on estuary fisheries		Employment opportunities	2016+	Matzikama Municipality DFFE: Alternative Livelihoods CapeNature	
	ii. Identify opportunities whereby local communities (particularly those from the disadvantaged sector) and stakeholders can benefit from the establishment of the Olifants River Estuary PA through job creation and business opportunities (e.g. protected area					

	management, ecotourism businesses, guiding, etc.)					
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7 INSTITUTIONAL ARRANGEMENTS

7.1 Key role players

It is essential that this EMP is regarded as a strategic plan that can guide the detailing of implementation actions and identification of implementing agents. Therefore, it leaves the detailing of the required resources (human and financial) required for proper management of the estuary for the implementation agents' own project plans. However, it does 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 action plans and the implementation thereof. Ways of empowering historically disadvantaged individuals with regards to the local management of the Olifants River Estuary must be explored and implemented.

Co-management and effective governance has already been identified as the keystone to the efficient and effective management of the Olifants River Estuary. Figure 7 lists the various actors and entities with interest in the Olifants River Estuary, and highlights the need for the multitude of parties to co-operate successfully in the area. The roles of the main groups are illuminated below.

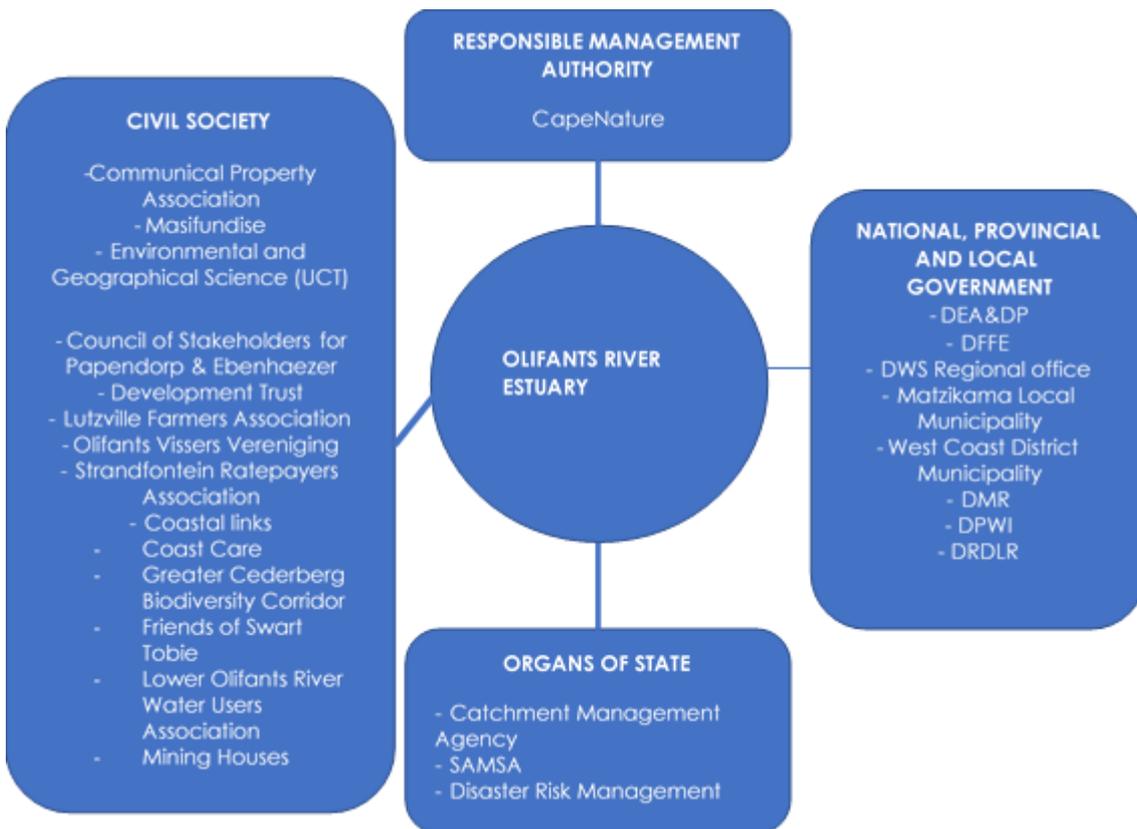


Figure 7: Key role players for the management of the Olifants River Estuary with CapeNature acting as the RMA

7.1.1 Estuary Management Authority

The Protocol identifies the **CapeNature**, or its assigned representative, as the **Responsible Management Authority** responsible for the development of the Olifants River EMP as well as being responsible for the co-ordination of its implementation. This coordination of the implementation function can be effected through a range of different forums and actors.

7.1.2 Olifants River Estuary Advisory Forum (OEF)

According to the Protocol, the **role of the existing OEF** is interpreted as providing an advisory service to the RMA on issues specific to the management and implementation of the EMP, as well as being the hub that links all stakeholders, which serves to foster stakeholder engagement and to facilitate the implementation of the project plans identified. The broader **community** will be able to voice concerns and raise issues via the OEF. This includes the CPA, Ratepayers' Associations, Non-government Associations, community groups, conservancies, etc., as well as representatives from surrounding industry and agriculture. Any representatives are obliged to raise issues identified by their constituents and to provide feedback to the constituents. Importantly, the OEF will not represent or supplant the individual positions of its members unless specifically mandated to do so.

7.1.3 Government Departments and organs of state

The successful implementation of the EMP may be seen as also dependent on the contribution of a number of governmental role players, including:

- **Western Cape Government departments:** Responsible for legislative support, including compliance, funding, research and monitoring;
- **West Coast District Municipality:** Responsible for legislative support and funding;
- Relevant **National government departments**, especially Department of Environmental Affairs, Department of Water and Sanitation (via the regional office), Department of Forestry and Fisheries, Department of Agriculture, Land Reform and Rural Development
- **Organs of State** (SANparks, CapeNature, Berg-Olifants CMA).

The National Department of Environmental Affairs is generally responsible for national standardisation of estuarine management and approval of provincially-compiled estuarine management plans. Direct involvement in individual estuaries, such as the Olifants, will occur via existing forums for intergovernmental coordination. These forums will have the management of the Olifants River estuary on their agendas from time to time, and include:

- **Western Cape Provincial Coastal Committee:** Responsible for facilitating co-management, effective governance and provincial co-ordination of estuarine management;
- **West Coast District Municipal Coastal Committee:** Responsible for facilitating co-management and effective governance.

7.2 Priority Project Plans

It is recommended that the following aspects of the EMP be implemented as a matter of priority within the first year (i.e. **HIGH PRIORITY**). All other aspects listed in the management action plans are by default then considered MEDIUM or LOW priority.

- Establishing a community conservation area to preserve vital estuarine habitats and species;
- Mediation between DFFE and the local fishing community, in terms of establishing a legal entity and a co-management committee for estuarine resource use, and developing a community-based fisheries management plan and;
- Securing funding, resources and capacity for the Olifants River Estuary Advisory Forum in support of its responsibilities and to facilitate the implementation of the project plans;
- Ensure that the EMP is accepted by the municipalities and incorporated into the IDPs and SDF;
- Engaging the Minister of DWS to approve the freshwater reserve;
- Establishing clear spatial and operational boundaries for mining activities; and
- Research and monitoring relating to the feasibility of mariculture operations and human use of the estuary, respectively.

8 MONITORING & EVALUATION

8.1 Resource Monitoring

Appendix 1 provides a list of recommended abiotic and biotic parameters to be monitored on the Olifants River Estuary to assess compliance with the recommended ecological reserve for the estuary (based on Taljaard et al. 2006). Additional recommendations have been included for monitoring of visitor numbers, profiles and opinions required in terms of the management plan.

8.2 Review and Evaluation

This EMP should be reviewed and updated on a five-yearly basis to ensure that objectives and targets are being achieved. An audit should be undertaken alongside the review and evaluation to determine and grade the success and failures with the implementation of the management plan according to the specified performance indicators (Appendix 2). The audit should ultimately be the responsibility of CapeNature, supported by the OEAF and Matzikama Municipality.

The review will involve revisiting the Situation Assessment to determine the progress or changes that have come about as a result of the EMP in terms of the objectives that were originally set as well as any changes in legislation or policies, and followed by revisions or refinement of the objectives and where necessary, aspects of the management actions plans or monitoring protocol.

9 RECOMMENDATIONS

The following recommendations are made to assist/ improve management of the Olifants River estuary:

- Spatial zonation of the system should be revisited in the next review by the RMA, in consultation with the EAF, the fishing community, respective municipalities and other relevant authorities (e.g. CapeNature), and amended if necessary.
- Future revisions of the zonation plan should also consider flexible recreational use areas as well as peak user days regulations.
- In order to ensure that issues pertaining to fishing and mining are raised and addressed, representatives of the fishing community and mining operations need to be present on the EAF.
- Uncontrolled recreational activities at the mouth must be addressed by the RMA in future revisions of this EMP, whereby effective strategies must be formulated to manage recreational use, especially during peak periods.
- In order to protect the biodiversity and ecosystem health of this critical water resource, all forms of mining must be prohibited from the estuarine functional zone of the Olifants River estuary.

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APPENDIX 1: RECOMMENDED MONITORING PROTOCOLS

The following table provides a list of recommended abiotic and biotic parameters to be monitored on the Olifants River Estuary to assess compliance with the recommended ecological freshwater reserve for the estuary (based on Taljaard *et al.* 2006). Additional recommendations have been included for monitoring of visitor numbers, profiles and opinions required in terms of the management plan

COMPONENT	MONITORING ACTION	RELATED TPC (see Appendix 2)	TEMPORAL SCALE (frequency and when)	SPATIAL SCALE (No. Stations)
1. BIRDS	Undertake counts of all water-associated birds. All birds should be identified to species level and total number of each counted.	1.1 – 1.2	Winter and summer survey, yearly	Entire estuary
2. FISH	Conduct fish surveys using both seine and gill nets as primary gear.	2.1 – 2.6	Winter and summer survey every 3 years starting 2009	Entire estuary (12 stns)
3. INVERTEBRATES	Zooplankton: Collect quantitative samples using a flow meter <u>after dark</u> , preferably during neap tides (mid to high tide). Sampling to be done at mid- water level, i.e. not surface. (Include chlorophyll a measurements on benthic microalgae and water column chlorophyll as to establish feeding links)	3.1	Same as for fish	Entire estuary (12 stns)
	Benthic invertebrates: Collect (subtidal) samples using a Zabalocki-type Eckman grab sampler with 5-9 randomly placed grabs (replicates) at each station. Collect intertidal samples at spring low tide using core sampling.	3.2	Same as for fish	Entire estuary (12 stns)
	Macrocrustaceans: Collected quantitative samples during neap tides (mid to high tide), at the same stations used for zooplankton, using a benthic sled with flow meter.	3.3	Same as for fish	Entire estuary (12 stns)
4. MACROPHYTES	Map main macrophyte communities using aerial photos or GPS	4.1 – 4.5	Every 3 years	Entire estuary
5. MICROALGAE	Phytoplankton: Conduct water column chlorophyll a measurements and counts of dominant phytoplankton group.	5.1 – 5.3, 5.5	Same as for fish	Entire estuary (8 stns)

COMPONENT	MONITORING ACTION	RELATED TPC (see Appendix 2)	TEMPORAL SCALE (frequency and when)	SPATIAL SCALE (No. Stations)
	Benthic microalgae: Conduct benthic chlorophyll a measurements	5.4	Same as for fish	Entire estuary (8 stns)
6. WATER QUALITY	Collect data on conductivity, temperature, suspended matter/turbidity, dissolved oxygen, pH, inorganic nutrients and organic content in river inflow	6.6, 6.7 & 6.8	At least monthly	At Lutzville causeway
	Monitor inorganic nutrient inflow from agricultural return flow in upper reaches (e.g. bore hole sampling)	6.6, 6.7 & 6.8	At least monthly	4 stns along upper banks
	Collected longitudinal salinity & temperature profiles (<i>in situ</i>)	6.1 – 6.5	To be measured when biotic surveys require information for interpretation	Entire estuary (12 stns)
	Water quality measurements taken along the length of the estuary (surface and bottom samples) for pH, dissolved oxygen, suspended solids/turbidity and inorganic nutrients.	6.7 – 6.9		Entire estuary (12 stns)
	Baseline data set for pesticides/herbicides accumulation in sediments	6.13	Every 3 years	Focus on depositional areas
7. HYDRODYNAMICS	Water level recordings	8.6	Continuous	Near mouth
	Flow gauging	7.1 – 7.3 & 8.1	Continuous	Near Lutzville causeway
	Aerial photographs of estuary (spring low tide)	4.1 – 4.4 & 8.5	Annually	Entire estuary
8. SEDIMENT DYNAMICS	Bathymetric survey: Series of cross-section profiles and a longitudinal profile collected at fixed 500 m intervals, but more detailed in the mouth (vertical accuracy better than 300 mm)	8.5	Every 3 years,	Entire estuary
	Set sediment grab samples (at cross section profiles) for analysis of particle size distribution (PSD) and origin (i.e. using microscopic observations)	8.3 - 8.4		Entire estuary
	Daily sampling of suspended sediment (and organic matter)	8.2	Daily	Sishen-Saldanha train bridge

COMPONENT	MONITORING ACTION	RELATED TPC (see Appendix 2)	TEMPORAL SCALE (frequency and when)	SPATIAL SCALE (No. Stations)
9. HUMAN USE	Collect statistics on the profile (origin, sex, age, income category) and activities of visitors to the Olifants River Estuary using self-fill in questionnaires,		Continuous	Visitor entry points
	Conduct regular counts of users and boats, separated by type.		Twice per week	Entire estuary
	Collect data on catch (species composition, abundance, size composition) and effort for the estuarine gill net and recreational angling fisheries		Daily	Entire estuary
10. ECONOMIC DEVELOPMENT	Collect statistics on income, poverty, and education levels of people in local communities surrounding the Olifants River Estuary to gauge impacts of key management interventions.		Every five years	Surrounding area
11. SOCIAL DEVELOPMENT AND HUMAN RIGHTS	Conduct a social impact assessment to establish a baseline for the introduction of the Protected Area and repeat in 5 years' time		Every 5 years	Surrounding communities
	Facilitate the establishment of a cultural heritage centre linked to ecotourism opportunities in the region and document and publish the oral histories of the local fishing community		Update annually	

APPENDIX 2: ECOLOGICAL SPECIFICATIONS AND THRESHOLDS OF POTENTIAL CONCERN (TPC) FOR MONITORING PARAMETERS LISTED IN APPENDIX 1

The following table provides “Ecological Specifications/Resource Quality Objectives” and “Thresholds of Potential Concern” (TPC) for the Olifants River Estuary as defined for the ecological freshwater requirements study completed for the Olifants River Estuary (Taljaard *et al.* 2006). In this context, “Ecological Specifications/Resource Quality Objectives” are defined as being 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 reserve category, in this case a Category B, while “Thresholds of Potential Concern” 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) should prompt management action. Note that thresholds of potential concern endpoints are generally defined such that they provide early warning signals of potential non-compliance to ecological specification (i.e. not the point of ‘no return’). Thus, indicators (or monitoring activities) included here incorporate biotic and abiotic components that are considered particularly sensitive to ecological changes associated with changes in river inflow and should be interpreted as such.

COMPONENT	ECOLOGICAL SPECIFICATIONS/RESOURCE QUALITY OBJECTIVES	THRESHOLD OF POTENTIAL CONCERN	POTENTIAL CAUSES
1. Birds	Retain the species richness, abundance and diversity of the bird community, representative of resident and migrant waders, wading birds and water fowl as under the Present State, except for that there would be an higher abundance of water fowl (increasing by about 10% from Present State numbers)	<p>1.1 Community composition or bird numbers deviates by more than 50% of average seasonal baseline counts for two consecutive summer or winter seasons, focusing on waders, wading birds, terns & water fowl (summer and winter), and specifically red data species which are supported by the system (e.g. Pelican, Oyster catchers, Chestnut banded plover)</p> <p>1.2 In the case of water fowl densities decline by 20% of average seasonal baseline counts for two consecutive summer or winter seasons</p>	<p>Changes in:</p> <ul style="list-style-type: none"> Salinity Invertebrate biomass/abundance Fish biomass/abundance in smaller size classes Vegetation habitats (e.g. reed beds, submerged macrophytes, salt marsh) Mud flats Human disturbance (not at moment)

COMPONENT	ECOLOGICAL SPECIFICATIONS/RESOURCE QUALITY OBJECTIVES	THRESHOLD OF POTENTIAL CONCERN	POTENTIAL CAUSES
2. Fish	Retain the following fish assemblages in the estuary: estuarine species (35%), partially estuarine dependent species (50-60%), obligate estuarine dependent (e.g. white steenbras) (>1%) and indigenous freshwater species (>1%). Exotic freshwater species (<0.5%)	<p>2.1 Level of estuarine species drop below 30% of total abundance</p> <p>2.2 Levels of obligate estuarine dependent species drop below 1% of total abundance</p> <p>2.3 Levels of partially estuarine dependent species drop below 50% or above 60% of total abundance</p> <p>2.4 Levels of exotic freshwater species above 0.5% (e.g. Mozambique tilapia out-competing resident species)</p> <p>2.5 Benthic dwellers species drop below 2% of total abundance in estuary above 18 km from the mouth</p>	<p>Changes in:</p> <ul style="list-style-type: none"> - Insufficient spawn biomass (national stock – marine) - Spawning failure due to environmental conditions (marine) - Recruitment failure (e.g. no cues reaching the sea from the estuary) - Habitat (macrophytes) - Water column (temperature, salinity, turbidity, dissolved oxygen) - Toxic substances (?) - Food availability (Invertebrate & fish) - Exploitation - Introduction in aliens
	Maintain recruitment of adult and juvenile fish at Reference Condition levels. This requires maintaining sufficient flow for freshwater plume (temperature, salinity and olfactory gradient) entering the sea. This implies that there should be a significant number of 0 -1 year old fish and no missing year classes.	<p>2.6 There are a missing year classes within a species</p>	<p>Blockage of eel migrations due to sand bar at mouth, Bad catchment practises/destruction of habitat, Blockage of migration due to dams.</p>
3. Invertebrates	Retain Present State species richness and mix (low species abundance, high dominance). However, under the present state one or two species are always present at high densities compared to others (e.g. <i>Pseudodiaptomus hessei</i> & <i>Ceratonereis keiskama</i>). For a B Category the higher densities need to be more variable in abundance during the year.	<p>3.1 Species richness is greater than 30 for zooplankton and macro invertebrates respectively (50% increase)</p>	<p>Changes in:</p> <p>Variability in intra-annual flow, e.g. loss of high flow pulses (>20 m³/s) in autumn/spring (salinity)</p> <p>Sediment grain size distribution and organic content</p>

COMPONENT	ECOLOGICAL SPECIFICATIONS/RESOURCE QUALITY OBJECTIVES	THRESHOLD OF POTENTIAL CONCERN	POTENTIAL CAUSES
	Indicator species such as <i>Capitella capitata</i> , should not dominate benthic species at any site	3.2 <i>Capitella capitata</i> exceeds 50% abundance of benthic species at any site	Increase in pollution (low oxygen high organic loading)
	<i>Calianassa</i> and <i>Upogebia</i> distribution patterns as under Present State	3.3 Abundance levels or areas of distribution decreases by more than 50% (mainly lower sandy reaches)	Changes in sediment characteristics along the estuary
4. Macrophytes	Maintain the present distribution (summer 2004) and abundance of the different plant community types (<i>Zostera capensis</i> (48 ha), intertidal salt marsh (92 ha), supratidal salt marsh (143 ha), floodplain salt marsh (797 ha), reeds and sedges (60 ha)	4.1 Greater than 20% change in the area covered by different plant community types	Increase in salinity and reduced flooding influencing depth to groundwater and groundwater salinity. Increase in turbidity would reduce submerged macrophyte cover.
	Reduce the areas covered by water weeds in the upper reaches by 50% compared to the Present State (summer 2004). Therefore area covered by invasive waterweeds (<i>Azolla filiculoides</i>), nuisance filamentous algae (e.g. <i>Enteromorpha</i> , <i>Ulva</i> , <i>Cladophora</i>) and pondweed (<i>Potamogeton pectinatus</i>) should be 30 ha (half of channel)	4.2 Upper 15 km of estuary with greater than 50% of estuary water channel covered by invasive waterweeds (<i>Azolla filiculoides</i>), nuisance filamentous algae (e.g. <i>Enteromorpha</i> , <i>Ulva</i> , <i>Cladophora</i>) and pondweed (<i>Potamogeton pectinatus</i>).	Low flow, lack of flushing and reduced current speeds. Reduced flooding that resets the estuary. High nutrient input from agricultural activities and return flow.
	Control the spread of invasive aliens in the riparian zone (e.g. <i>Sesbania punicea</i> and <i>Eucalyptus</i> spp.).	4.3 Greater than 20 % increase in area covered by invasive plants.	Disturbance of riparian zone due to human impacts such as bulldozing and clearing of natural vegetation
	Maintain reed and sedge areas (60 ha) and brackish salt marsh (~10 ha) as for the Present State (summer 2004) (by preventing salinity of 20 ppt to move further upstream than 8.5 km and remain there for greater than 3 months).	4.4 Dieback of reeds and brackish salt marsh at 8.5 km and further upstream from the mouth.	Reduced flow and an increase in saline intrusion.
	Prevent an increase in bare ground in the floodplain salt marsh by maintaining groundwater salinity at <70 ppt and depth to the water table at < 1.5 m	4.5 Greater than 20% increase in bare ground in salt marsh.	Reduced flow and flooding, increase in groundwater salinity and depth to groundwater.
5. Microalgae	Maintain a low phytoplankton biomass with a small REI (i.e. 10 ppt to river +1 ppt) zone	5.1 Phytoplankton biomass exceeds 15 µg/l chlorophyll a in summer and 10 ug/l chlorophyll a in winter 5.2 Blue-green algae exceeds 10% of phytoplankton cell counts	Water flow rates falling too low in winter or summer.

COMPONENT	ECOLOGICAL SPECIFICATIONS/RESOURCE QUALITY OBJECTIVES	THRESHOLD OF POTENTIAL CONCERN	POTENTIAL CAUSES
	Maintain microalgal group diversity as measured under Present State (2004)	5.3 Flagellates cease to be the dominant group and diatoms become less diverse (<10 taxa per site)	Reduced freshwater inflow rates and high salinity near the upper areas of the estuary.
	Maintain intertidal and subtidal microphytobenthic biomass as measured under Present State (2004).	5.4 Benthic microphytobenthic biomass exceed 40 mg/m ² chlorophyll a	Elevated nutrient in the inflowing freshwater.
	Maintain a low frequency of dinoflagellates	5.5 The frequency of dinoflagellates exceeds 5% of the total phytoplankton counts	Eutrophication of inflowing river water.
6. Water quality	Salinity intrusion should not to cause exceedence of TPCs for fish, invertebrates, macrophytes and microalgae (see above)	6.1 Salinity greater than 20 ppt for long than 3 months at 7 km upstream from the mouth (brackish saltmarsh, reeds and sedges & invertebrates) 6.2 Salinity of groundwater increases to 50 ppt and depth to water table to 1 m. (flood plain salt marsh) 6.3 Total dissolved solids (measure of 'salinity') of river inflow exceeds 3500 mg/l (phytoplankton) 6.4 Salinity in estuary exceeds 35 ppt (prevent hyper- salinity) (phytoplankton) 6.5 Salinity greater than 10 ppt occurs above 16 km upstream of the mouth (fish)	Modification of volume of river inflow Quality of agricultural return flow
	System variables (Temperature, pH, turbidity, dissolved oxygen, suspended solids and turbidity) not to cause exceedence of TPCs for biota (see above)	6.6 River inflow: Summer temp < 20°C pH < 6.5 'Turbid' river inflow (to be determined) Dissolved oxygen < 4 mg/l 6.7 Secchi disc reading above 8 km from the mouth is greater than 1 m (proxy for turbidity in estuary) 6.8 pH > 8.5 or < 6.5 in river inflow or in estuary 6.9 Water column DO drops below 4 mg/l (1 m above bottom except in deep holes) (need to investigate DO level at night in dense macrophyte beds)	Changes in water quality of river inflow at head of estuary and as a result of agricultural return flow along the banks of the upper estuary. Excessive macroalgal/microalgal growth in the estuary

COMPONENT	ECOLOGICAL SPECIFICATIONS/RESOURCE QUALITY OBJECTIVES	THRESHOLD OF POTENTIAL CONCERN	POTENTIAL CAUSES
	Inorganic nutrient concentrations not to cause exceedance of TPCs for macrophytes and microalgae (see above).	<p>6.10 When average river inflow is less than 5 m³/s and average DIN concentrations exceed 100 µg/l in river inflow and DIN concentrations in the upper reaches of the estuary (above 16 km from mouth) exceed 100 µg/l</p> <p>6.11 During high flow season (flows > 20 m³/s) average DIN concentrations exceed 500 µg/l in river inflow and average DIN concentrations in the upper reaches of the estuary (above 16 km from mouth) exceed 500 µg/l</p> <p>6.12 Average DRP concentration exceed 100 µg/l in river inflow and average DRP concentrations in the upper reaches of the estuary (above 16 km from mouth) exceed 100 µg/l</p>	Changes in water quality of river inflow at head of estuary and as a result of agricultural return flow along the banks of the upper estuary.
	Presence of toxic substances not to cause exceedance of TPCs for biota (see above).	6.13 For pesticides/herbicides baseline studies still need to be undertaken before TPCs can be set (special concern in upper reaches with extensive agricultural activities along banks of estuary)	Inputs from agricultural activities in the catchment and along the banks of the estuary in upper reaches
7. Hydro-dynamics	Maintain a flow regime to create the required habitat for birds, fish, macrophytes, microalgae and water quality	<p>7.1 River inflow distribution patterns differ by more than 5% from that of Scenario 2 (i.e. recommended flow scenario for the Olifants)</p> <p>7.2 River inflow decreases to below 1.5 m³/s at any time</p> <p>7.3 River inflow below 2 m³/s persist for longer than 4 months</p>	Modification to inflow at head of estuary
8. Sediment dynamics	Flood regime to maintain the sediment distribution patterns and aquatic habitat (instream physical habitat) so as not to exceed TPCs for biota (see above)	<p>8.1 River inflow distribution patterns (flood components) differ by more than 10% (in terms of magnitude, timing and variability) from that of the Present State (2004)</p> <p>8.2 Suspended sediment concentration from river inflow deviates by more than 10% of the sediment load discharge relationship to be determine as part of baseline studies (Present State 2004)</p>	Modification to inflow at head of estuary

COMPONENT	ECOLOGICAL SPECIFICATIONS/RESOURCE QUALITY OBJECTIVES	THRESHOLD OF POTENTIAL CONCERN	POTENTIAL CAUSES
	Changes in sediment grain size distribution patterns not to cause exceedance of TPCs in benthic invertebrates (see above).	<p>8.3 The median bed sediment diameter deviates by more than a factor of two from levels to be determined as part of baseline studies (Present State).</p> <p>8.4 Sand/mud distribution in middle reaches (8-20 km) change by more than 20% from Present State (2004)</p> <p>8.5 Changes in the channel bathymetry in the upper reaches (above 20 km upstream of the mouth) change by more than 20% from Present State (2004)</p> <p>8.6 Changes in tidal amplitude below the Lutzville causeway of more than 20% from Present State (2004)</p>	Modification to inflow at head of estuary; Catchment activities

APPENDIX 3: RECOMMEND PERFORMANCE MONITORING PROTOCOL

MANAGEMENT OBJECTIVES	PERFORMANCE INDICATOR	TIMING	LEGISLATION	RESPONSIBILITY
1. Conserve biodiversity and sense of place				
a. Establish a Protected Area/ Management Area (SMA)	Lower Olifants River Estuary receives formal protection	Once a year	ICM Act NEM:PAA	CapeNature, OEAF, DEA
b. Facilitate the establishment of a functional co-management committee for estuarine resources	Co management committee established Small-scale community fisheries management plan is in place and regularly updated	Assess twice a year	MLRA	DEFF, DEA, OEAF, CapeNature
c. Integrate into IDP/SDF	OEMP is reflected in the local/district IDP and SDF, and coastal management line is gazetted	Every IDP/SDF review cycle	ICM Act, MSA	Matzikama LM,
d. Regulate boat traffic	Boating and other estuary uses occur only within designated areas and according to specific regulations	Every 5 years	ICM Act, MSA, Seashore Act	Matzikama LM, WCDM, CapeNature
2. Co-operative and effective governance				
a. Appoint Olifants River Estuary Advisory Forum	Confirmed members and constituted OEAF	End of 1st year	ICM Act	CapeNature
b. Define co-operative governance arrangements	Confirmed roles & responsibilities of participating agencies	Assess every 2 years	ICM Act, NEM:PAA	OEAF, CapeNature, Matzikama LM, DEA,DWS
c. Secure financing	Funding is secured for next 5 years	Assess twice a year	ICM Act, NWA, CARA, MSA	Matzikama LM, DEA&DP, Key partners, CapeNature
d. Provide resources and capacity	Office space obtained and adequately equipped, manned by knowledgeable and well-trained permanent staff	Assess twice a year		Matzikama LM, DEA&DP, Key partners, CapeNature
3. Restoration of estuary health				
a. Secure freshwater input	Ecological health category B is achieved	Biannual for DWS	NWA	DWS, Matzikama LM, OEAF, CapeNature
b. Lobby to rehabilitate mined habitat	Degraded habitat rehabilitated and functional. Improvement in ecological health indices.	Ad hoc visual monitoring during normal daily activities	MPRDA	CapeNature, Matzikama LM,
c. Reduce disturbance to the estuarine functional zone	Retreat & prevention of detrimental mining activities Improvement in ecological health indices.	Once a year	MPRDA	CapeNature, Matzikama LM, DEA, DMR
4. Research and monitoring				

MANAGEMENT OBJECTIVES	PERFORMANCE INDICATOR	TIMING	LEGISLATION	RESPONSIBILITY
a. Promote scientific research incorporating local knowledge	Increase in number of research projects and monitoring programmes	Once a year		Matzikama LM, OEAF, CapeNature
b. Monitor estuary health	On-going databases and reports produced Increase in number of local community members trained	Biannual for DWS Monthly for OEAF; Assess training outputs twice a year	NWA	Matzikama LM, DWS, OEAF, CapeNature
c. Monitor human use and socio-economic conditions	On-going databases and reports produced Increase in number of local community members trained	Ad hoc visual monitoring during normal daily activities; Assess training outputs twice a year	MLRA	Matzikama LM, OEAF, CapeNature
5. Increasing public awareness				
a. Create mechanisms for communication with stakeholders	Widespread and effective communication to a diversity of stakeholders who are well informed through their preferred method of communication	Once a year	ICM Act	Matzikama LM, OEAF, CapeNature
b. Develop education and awareness programme	Visitor centre open to public Increase in number of newsletters, pamphlets, posters Sufficient number of public notice boards Increasing number of visiting groups	Once a year	ICM Act	Matzikama LM, OEAF, CapeNature
6. Promoting ecotourism				
a. Establish and manage visitor facilities	Increase in number of tourists per year Increase in tourism-related development and businesses/enterprises			Matzikama LM, OEAF, CapeNature
b. Market the Olifants River Estuary	Increase in number of newsletters, pamphlets, and posters Increase in number of tourists per year			Matzikama LM, OEAF, CapeNature
7. Enhancing local livelihoods				
a. Sustainable use of estuary resources	Integrated Fisheries Management Plan developed Set number of permits issued to local community Feasibility of mariculture operation determined		MLRA	DEFF DEA:OC Matzikama LM CapeNature

MANAGEMENT OBJECTIVES	PERFORMANCE INDICATOR	TIMING	LEGISLATION	RESPONSIBILITY
b. Provide supplementary livelihoods	Increase in number of trained and employed persons On-going provision of employment opportunities through growing economic development			CapeNature, Matzikama LM DEA: Alternative livelihoods