C.A.P.E. ESTUARIES MANAGEMENT PROGRAMME

GOURITZ ESTUARINE MANAGEMENT PLAN

VOLUME I

SITUATION ASSESSMENT
(STATE OF PLAY REPORT)

Produced by:
Enviro-Fish Africa (Pty) Ltd
22 Somerset Street
Grahamstown
6139

Produced for:
Cape Nature
Pvt Bag X29
Rondebosch
7701

September 2008

TABLE OF CONTENTS

EXECUTIVE SUMMARY

INTRODUCTION

This is a situation assessment or state of play report for the Gouritz Estuary and will form the basis from which an Estuarine Management Plan will be developed, based on the National Estuarine Management Protocol as outlined in the new Integrated Coastal Management Bill. The report describes the current situation on the Gouritz estuary and provides an assessment of the legal requirements relevant to the system, a bio-physical description, a description of land-use patterns, water use and requirements, good and services, exploitation of living resources, economic importance, conservation and rehabilitation priorities, institutional arrangements, recommendations for management and the way forward with regards the formulation of the EMP itself. The estuary has also been represented spatially in the form of GIS maps which indicate land-use patterns and infrastructure, recreational use areas, exploitation areas, sensitive habitats and proposed sanctuary areas.

BIO-PHYSICAL DESCRIPTION

PHYSICAL DESCRIPTION

The catchment that supplies the Gouritz river is extensive and drains an area in excess of 45 000 km^2. Mean annual precipitation is 262 mm and the MAR is 695 x 10^6 m^3. The catchment covers six eco-regions, namely Great and Nama (Little) Karoo, Southern and Western Folded Mountains and the South-Eastern and South-Western Coastal Belt. The main tributaries feeding into the Gouritz River are the Olifants in the east, the Gamka in the north and the Groot in the north-west. The remaining rivers which comprise smaller tributaries within the greater catchment are the Touws, Buffels, Dwyka, Koekemoers, Leeuw and Kammanassie. Main land-uses in the catchment are irrigated agriculture, livestock and some conservation areas. According to the DWAF State of the Rivers Report the majority of rivers and tributaries are in a good to fair state, with only the lower Olifants west of Oudtshoorn and the Buffels river at Laingsburg being classed as poor.

The Gouritz estuary is a medium/large, permanently open system, entering the sea through a shallow dynamic mouth region which shifts according to tidal and freshwater flood regimes. The Gouritz estuary is a Type F Barred system which means it is characterized by a supratidal barrier at the mouth and has a Mean Annual Runoff (MAR) of <15 x 10^6 m^3. Net longshore transport of sediment at the mouth as a result of the dominant south-westerly swells is towards the east and as such the sandspit (barrier) tends to form from the west. Depth at the mouth ranges from 0.5 to two meters at high tide, while main channel depth has been measured between 1.3 and four meters, with the deepest site of six meters located near the road crossing. The system is mostly marine dominated but severe flooding from the inland catchment occurs from time to time. The banks for the most part of the middle to upper reaches are gently sloping but the extreme upper reaches are characterized by steep-sided banks on both sides. The estuary extends a maximum of 10 km from the mouth when freshwater flows are at a minimum and tidal influences are dominant. Degradation of the estuary due to coastal developments, off-road driving, trampling of riparian habitats, modified or altered habitats and channels, livestock grazing and planting of crops close to the edge that cause bank collapse, erosion and increased sediment loads, nutrient enrichment from agricultural practices, invasive alien plants and fish, and weirs and abstraction activities that obstruct/alter flow dynamics, is cause for concern.

Physico-chemical characteristics of the estuary are not well documented but limited historical data for salinity and oxygen concentrations indicates good mixing except in the upper reaches when freshwater runoff causes stratification. The estuary is marine dominated with salinities ranging from 34 ppt at the mouth to 23.3 ppt eight km upstream. Recent monitoring of salinities has shown that freshwater pulses have become weaker and infrequent and confirmed that marine influences are strong. Periodical construction of barriers above the road bridge isolates the estuary from the river and results in the breakdown of the river-estuarine-interface (REI).

BIOLOGICAL DESCRIPTION

Algae and aquatic vegetation

Marine algae (*Porphyra capensis* and *Sargassum heterophyllum*) appear to be restricted to the rocky platforms on the eastern bank in the mouth region. Submerged macrophytes are not well represented in the system and there are conflicting reports of isolated *Zostera capensis* beds on some mudbanks. Saltmarshes are not extensive but are dominated by *Sarcocornia perennis, Chenolea diffusa, Cotula coronopifolia, Disphyma crassifolium, Sporobolus virginucus* and *Salicornia meyerana* in the areas close to the mouth and near to the water. In the middle to upper reaches, saltmarsh vegetation is represented by *C. coronopifolia, Triglochin* spp. and *Sarcocornia* sp. Further away from the water a transition zone between the terrestrial vegetation types comprises *Juncus kraussii, Stenotaphrum secundatum* and *Suaeda caespitosa*. A single rare species (*Reihania garnotii*) is confined to this community. Large patches of *Spartina maritima* are found semi-submerged along the waters edge but not always in association with other saltmarsh plants. The flora associated with areas of freshwater seepage is dominated by *Juncus acutus, J. kraussi* and *Phragmites australis*.

Aquatic invertebrates

The mudprawn (*Upogebia africana*) is found on all mudbanks of the estuary and sandprawns (*Callianassa kraussii*) are found on sandbanks from about 6.5 km from the mouth to areas well beyond the Road Bridge and Die Eiland. Bloodworm (*Arenicola loveni*) and pencil bait (*Solen* sp.) has been found in the past, but appear to be absent now. Although the swimming crab (*Scylla serrata*) is found in the estuary, the numbers are low.

Fish

The rivers of the Gouritz catchment feature six indigenous freshwater species, of which at least two (*Pseudobarbus asper* and *P. tenuis*) are endangered/threatened. Several eel species are also present, but these are strictly speaking catadromous as adults migrate to sea to spawn. Invasive fish in the catchment include *Tilapia sparrmanii, Cyprinus carpio, Micropterus salmoides* and *Clarias gariepinus*.

Until recently a detailed ichthyofaunal survey of the Gouritz estuary had not been conducted, and only eleven species were recorded during the River Health Programme study. These were *Gilchristella aestuaria, Mugil cephalus, Myxus capensis, Liza richardsoni, L. dumerilii, Atherina breviceps, Monodactylus falciformis, Solea bleekeri, Lichia amia, Psammogobius knysnaensis* and *Lithognathus lithognathus*. Earlier surveys also found *Argyrosomus japonicus, Pomatomus saltatrix, Pomadasys commersonnii, Galeichthys feliceps, Rhabdosargus globiceps, R. holubi* and *Caffrogobius multifasciatus*. Recent monitoring has shown that the estuary has a rich ichthyofauna dominated by dusky kob, spotted grunter, white sea-barbel, white steenbras and leervis. There are no records of larval fish.

Elasmobranch species appear to be restricted to the mouth area and include *Gymnura natalensis*, *Myliobatus aquila*, and *Rhinobat*os *annulatus*.

Reptiles and amphibians
Surveys within the planning area and environs have revealed eleven amphibian species, three tortoises, 26 snakes and 12 lizards, none of which are rare or endangered species.

Birds
Historical records of waders on the Gouritz revealed 292 birds from 12 species of which 35 (comprising two species; whitefronted plover and Kittlitz's plover) were residents and 257 migrants (including ringed plover, turnstone, grey plover, curlew sandpiper, little stint, knot, terek sandpiper, greenshank, bar-tailed Godwit and whimbrel). Later counts comprised 17 species totaling 158 birds on one occasion, with the most abundant being kelp gulls followed by swift terns and whitefronted plovers. On another occasion, 36 species (totaling 625 birds) were recorded and were dominated by the summer migrants such as the curlew sandpiper, terek sandpiper, ringed plover, greenshank, little stint and whimbrel.

More recently the Animal Demography Unit's (ADU) Coordinated Waterbird Counts (CWAC) has compiled data for the Gouritz since 2000 from the mouth region to the Low-water Bridge. Between October 2000 and July 2007, ten counts were conducted by the CWAC programme and a total of 57 species identified. Of these, 28 species were only seen on three or less occasions and 13 species are represented by between one and three individuals. Kelp gulls are by far the most abundant species followed by the Egyptian goose and swift terns. Breeding activity has only been confirmed for three species, namely the Egyptian goose, African fish eagle and Black harrier.

Mammals
There are no records of mammals directly associated with the estuary although 80 species, including the Cape clawless otter, are thought to occur in the region, including the catchment. Of these, eight species are listed as being rare or vulnerable.

Terrestrial Vegetation
Vegetation associated with the middle to lower reaches of the estuary comprises arid scrub thicket, renosterveld, strandveld, strandveld – thicket mosaic, dune scrub, dune scrubland, *Acacia cyclops* thicket, dune thicket, limestone fynbos and secondary grassland.

A recent vegetation sensitivity analysis on a portion of land located to the west of the middle reaches of the estuary, revealed nine rare and endemic (to the immediate area) plant species. One of these, *Leucadendron galpinii* is also listed as a vulnerable Red Data species.

Alien vegetation
The predominant alien plants in the lower estuarine area are rooikrans (*Acacia cyclops*), gum tree (*Eucalyptus* sp.), kikuyu (*Pennisetum clandestinum*), prickly pear (*Opuntia ficus-inidica*) and manatoka (*Myoporum tenuifolium*). Alien plants in the riverine regions include Kariba weed (*Salvinia molesta*), red water fern (*Azolla filiculoida*) and Spanish reed (*Arundo donax*).

LEGISLATION AND PLANNING DOCUMENTS

The purpose of this section in the report is to review all forms of legislation and all planning/management documents that may have an impact on the formulation of the EMP

and the management of the Gouritz estuary. This review incorporates international agreements, strategies and obligations as well as all forms of National (Acts and Policies), Provincial, Regional (including old Cape of Good Hope Ordinance) and local legislation. Local legislation and planning documents include municipal by-laws (still to be promulgated), recommendations and requirements detailed in the IDP and SDF planning documents and strategies within the Integrated Hessequa Environmental Policy (IHEP) for biodiversity conservation, coastal zone management, climate change, environmental education, estuaries and rivers, and management of Gouritsmond Commonage. Most of these planning documents all form the protection of estuarine and wetland habitats and place severe restrictions on future developments in these areas.

GOODS & SERVICES

The majority of land within the greater catchment and along the Gouritz floodplain adjacent to the estuary is zoned as agricultural and a variety of high-intensity, irrigation dependant farming activities take place. Several conservation areas also exist, including the buffer zone of open space surrounding Gouritsmond which abuts onto the estuary to the north and north-east. There appear to be no restrictions governing how close to the river or estuary farming activities may take place, and in most cases cultivated lands or grazing of livestock takes place up to the waters edge.

The town of Gouritsmond located immediately to the west of the estuary mouth is classified as a third order Regional node in the Hessequa SDF and ranks only 97th out of 131 Western Cape towns in terms of growth potential. There are currently no large-scale developments on the eastern side of the estuary and the resorts of Kanon, Fransmanshoek and Vleesbaai are located outside of the area of concern. The residents of these resorts, however may make use of the good provided by the estuary in the form of fishing or recreational boating. Although several large-scale residential developments adjacent to the estuary have been planned, these have been successfully opposed by the Gouritz River Conservation Trust and the Municipality.

There is a single functioning slipway on the western side of the estuary just outside the urban edge of Gouritsmond comprising a parking area, a shelter for the river control officer, three braai areas, several waste containers, information boards and ablution facilities. An additional *ad hoc* type slipway and two small boat houses are located in the middle reaches of the system. Recreational activities include swimming, windsurfing, kite boarding, canoeing, boating, water skiing, hiking, bird watching, dog walking and fishing/bait collecting. Several commercially-licensed deep-sea boats and many recreational ski-boaters use the slipway and the estuary as a launch site. There are no jetties on the estuary, but one is being considered for the area adjacent to the slipway.

A single bridge crosses the estuary just before the road meets with the R325 and just above the area known as Die Eiland. The location of the structure and the degree to which the banks and flow of the estuary have been altered is cause for concern. Remnants of the old bridge are still present in the estuary and should be removed to improve flow along this section. The bridge spanning the river along the N2 does not interfere with the river or flow in any way.

Many sections of the estuary bank on both sides of the channel are severely eroded due to a combination of destabilization due to overgrazing; livestock accessing the estuary to drink; cultivating land too close to the edge; farm vehicles driving too close to the edge; fishermen

walking along the edge and down onto mudbanks to access bait; wave damage from wind driven waves; flood damage; and to a lesser extent boat wakes. Attempts to stabilize this damage have been undertaken at several sites and gabions have been used to try and rectify the problem.

Above the estuary, the river itself is used extensively by farmers as a source of freshwater. At least eight pumps are located between the road bridge and the kranz's and this is only the extreme lower portion of the river. Water is pumped almost on a continual basis when levels are high enough. Several supply pipelines run along the bottom the estuary from the west to the east in order to supply farms with no access to groundwater and some have large structures protruding into the estuary for protection.

EXPLOITATION OF LIVING RESOURCES

CURRENT LEGISLATION

National legislation prohibits scuba diving, spearfishing, fishing without a permit and the use of fish nets other than a landing net or casting net in all estuaries. In addition, no fish captured in an estuary may be sold. A Hessequa municipal by-law (yet to be promulgated) prohibits people from holding or arranging any fishing competition without permission from the Municipality and the Gouritz River Conservation Trust. Fishing from any bridge or within 20 metres either side of a slipway is also prohibited.

FISHERY

Historically, the Gouritz estuary has been considered to be an excellent fishing destination, and was particularly known for periodic runs of large dusky kob during September, October and November. Fishing is distinctly seasonal, with very little fishing effort occurring between June and August. Grunter fishing in the estuary occurs throughout the year, with recreational and subsistence fishers targeted these fish using mud prawn, sand prawn and sand mussel. Unlike the grunter, large dusky kob are targeted during spring and summer using a variety of baits such as live mullet, sardine, squid, octopus leg and artificial lures (rapalas).

The majority of recreational anglers come from Gouritsmond and the nearby urban centres of George, Albertinia and Mossel Bay. During December and April, a large proportion of the recreational fishers come from further away, including Cape Town, Bloemfontein, Johannesburg and Pretoria. The subsistence users hail from the immediate vicinity of Gouritsmond/Bitouville and the surrounding farms.

Fishing effort

There appears to be a significant amount of boat-based and shore fishing effort on the Gouritz Estuary. The Municipal River Control Officer estimates that approximately 80% of people launching boats from the slipway utilize the estuary's living resources. Records of boat registration permits between 2000 and 2008 suggest that there is increasing pressure on the estuary; the number of boat trips on the river per year ranged from approximately 1200 in 2000/2001 up to 6600 in the 2006/2007 season. Most of the boating activity occurs during spring, summer and autumn, peaking during the major holiday periods in December and April.

Shore angling effort in the Gouritz estuary is not as high as boat-based angling effort. The lack of access to the estuary shoreline, particularly in the middle and upper reaches is a major

contributing factor. The slipway parking lot is the major access point for shore anglers on the western shore.

Distribution of effort
All boat fishing takes place between the mouth and approximately 8 km upriver at "Bar se Gat". Within this area, there are four high effort zones including the areas around what is known as "Steentjie se Gat", "Witkopklip" and "Bar se Gat".

Recreational shore fishing effort occurs mostly at sites where fishers can readily access the shore. Due to the limited access on the eastern shore, which is mostly privately owned farmland, shore fishing areas for the public are almost exclusively on the western shoreline. Most shore fishing occurs from the slipway area up to Witkopklip, at "Bar se Gat" and around the road bridge at "Die Eiland". There is limited subsistence fishing effort in the estuary, mostly around "Witkopklip".

Illegal netting has been and remains a problem in the Gouritz Estuary.

Catch per unit effort
No data available.

BAIT FISHERY
Bait organisms in the Gouritz Estuary are targeted by recreational boat, recreational shore and subsistence anglers. Of the bait organisms found in the estuary, mudprawn and mullet are most frequently harvested by anglers. Rock and surf anglers also collect bait (mostly live bait) in the estuary.

Distribution of effort
Bait collection effort is focused around the lower reaches of the estuary. Here recreational boat, recreational shore and subsistence fishers collect mudprawn and livebait. Recreational shore and subsistence fishers mostly collect bait from just below the slipway to Witkopklip on the western shore. Recreational boat anglers collect mudprawn wherever they occur. Sand prawns are mostly found and harvested in the upper reaches of the estuary. Mullet occur throughout the estuary with shore fishers mostly targeting them between the slipway and Witkopklip and boat anglers targeting them throughout.

CURRENT FISH AND BAIT REGULATIONS
While the existing regulations have been implemented nationally in an attempt to maintain a healthy fishery, a history of disregard for the regulations is thought to be a major contributor to the poor fishing in the estuary. Anglers frequently retain undersize fish, exceed their bag limits and sell their fish. Recently, at least one boat has been recognized to be involved in illegal gillnetting and several reports of illegal gillnetting have been received by MCM. Boat anglers were also recognized as the group mostly responsible for the illegal activities. Approximately 30% of all user groups fish without licenses.

MONITORING AND ENFORCEMENT
Enforcement and monitoring of living resource exploitation on the Gouritz estuary is practically non-existent, with MCM officers patrolling the system about twice a year. The Hessequa Municpality has appointed a single River Control Officer to issue and enforce boat licenses and to monitor other by-laws. The officer is however not appointed in terms of the MLRA and is thus unable to enforce the Act as it applies to living resource regulations. Cape

Nature is responsible for ensuring compliance with regulations pertaining to the construction of structures (slipways and jetties) on the estuary in terms of the Seashore Act.

ANGLER AND RESIDENT PERCEPTIONS

Co-management of the estuary under the local management institution (Gouritz River Conservation Trust) with direct involvement all key stakeholders was seen as being a feasible option by most fishers. However, the lack of current institutional support with regards to enforcement of the MLRA is seen as a major stumbling block. The lack of compliance to regulations by fishermen was not seen by them as a major factor contributing to the decline in fish catches. Overall, fishermen felt that silting caused by reduced flows and increased erosion, and the trawlers operating in the inshore marine environment were mostly responsible for the decline in the fishery.

THE WAY FORWARD

In the case of the Gouritz estuary, local issues such as the removal of large dusky kob by fishers must be considered when developing a management plan. Estuary specific fishery regulations may therefore be addressed in the EMP. The problem of poor law enforcement capacity on the estuary should also be addressed in the management plan. The current size and bag limit regulations governing the exploitation of living resources are generally not considered effective in areas with poor enforcement capacity. Alternatively, closed areas and closed seasons are considered more effective and are therefore likely to be more suited to the Gouritz estuary.

There are a number of potential fish and bait regulations, and proposals to enhance the monitoring capacity on the estuary. Given the poor stock status of dusky kob in South Africa, potential regulations for this species include a zero bag limit, a closed season, a window size limit, a ban on night fishing, and an estuarine protected area. For the bait fishery, a closed area or a harvesting rotation system are proposed. Furthermore, the potential for poverty alleviation in the form of a subsistence bait fishery during high effort months (April and December) could be investigated.

WATER QUANTITY AND QUALITY REQUIREMENTS

CATCHMENT DESCRIPTION

The Gouritz River Catchment drains an area of 45,134 km^2 and has a river length of 328 km. The catchment has two distinct areas: a large, dry inland area that is comprised mainly of the Karoo and Little Karoo; and the smaller humid strip of land along the coastal belt. There are four sub-catchments;

- The Gamka sub-Catchment comprising the catchment of the Gamka River upstream of the confluence with the Olifants River, downstream of which the river is known as the Gouritz River. The largest dams in this sub-catchment are Gamkapoort and Leeu-Gamka Dams. The total dam capacity is 80.4 million m^3, which represents 35% of the nMAR.

- The Groot sub-Catchment comprising the catchment of the Groot River down to its confluence with the Gouritz River. The largest dams in this sub-cacthment are Floriskraal and Bellair Dams. The total dam capacity is 82.4 million m^3, which represents 78% of the nMAR.

- The Olifants sub-catchment comprising the catchment of the Olifants River. The largest dams in this sub-catchment are Stompdrift and Kammanassie Dams. The total dam capacity is 112 million m^3, which represents 49% of the nMAR.

- The Gouritz sub-catchment comprising the catchment of the Gouritz River downstream of the above catchments. There are no major dams in this catchment. The top end of the estuary is located about 10 km from the river mouth, within quaternary catchment J40E.

RIVER HEALTH

The overall Present Ecological State of the lower Gouritz River appears to be in a ***Moderate*** condition. Detailed information on aquatic invertebrates in the Gouritz River Catchment is available from the National River Health Database. However, the lowest biomonitoring site for which data are available (J4Gour-Herbe) is located 37 km upstream of the top end of the estuary. The ecological conditions of the river where it enters the estuary are therefore unknown. Taxa recorded are typical of a shallow, sand-dominated substrate, and include baetid mayflies, hydropsychid caddisflies, Corixidae and Gomphidae.

A total of 12 species of indigenous fish are expected at biomonitoring point J4Gour-Herbe, a further seven species of exotic or translocated fish are known to occur. The overall present state for fish is rated as *Poor*, mainly because of the high proportion of exotic species.

NATURAL HYDROLOGY

The simulated natural mean monthly total flows at the lower end of the Gouritz Catchment show moderate seasonality, with highest total flows usually in March, and lowest total flows in July. The natural Mean Annual Runoff (nMAR) for the Gouritz River Catchment at the lower boundary of quaternary catchment J40E is estimated at 564.0 million m^3/a. The average annual rainfall over most of the catchment varies between 100 and 300 mm, while the coastal area has an annual rainfall of 400 to 500 mm/a.

Simulated monthly natural flows indicate that natural flows are highly flashy, as would be expected for a system that drains an area that is largely arid. The data indicate that the lower Gouritz River is naturally seasonal, with flow cessation occurring in January and February in most years.

OBSERVED HYDROLOGY

The lower Gouritz River has two flow gauges at Bonavontuur and Zeekoeidrift. The gauge at Bonavontuur has no rating table, so there are no flow data available. This means that the only available flow data for flows entering the estuary are recorded at Zeekoeidrift. This rated cross-section is located 70 km upstream of the top end of the estuary in a pool under a bridge, so low flows are likely to be unreliable. There are a number of tributaries that enter the river between this gauge and the estuary, but these are small tributaries, so the impact on flows is likely to be small. Data from this gauge show that seasonal flow patterns have changed significantly compared to natural flows. Observed median monthly flows were typically 0.47 m^3/s, which is significantly lower that the comparable value of 2.187 m^3/s under natural conditions. These changes are not surprising, given the large number of dams that have been constructed in the catchment.

ECOLOGICAL RESERVE

The Ecological Water Requirements (EWR) of the Gouritz System has not been assessed in any detail. Consensus is that the Ecological Importance and Sensitivity of most of the Gouritz

River Catchment is ***Moderate***. Likewise the Present Ecological State and the recommended (default) Ecological Management Category for the area is rated as ***Moderate***.

A desktop assessment of the EWR of the lower Gouritz River, at the downstream boundary of quaternary J40D, was estimated at 98.649 million m^3/a, representing 18.04% of the nMAR. This value is significantly higher than previous estimates. The lower boundary of catchment J40D is about 21 km upstream of the top end of the estuary. For the purposes of this study it was considered more appropriate to assess the EWR further downstream, and include the contributions of the tributaries in the lower reaches. A Desktop Reserve Model was therefore run cumulatively at the lower boundary of J40E, and recommended an EWR for a Category C management objective of 101.864 million m^3/a, which is comparable to the results of the EWR at J40D. These flows represent 18.06% of the nMAR. The median EWR varies between 0 million m^3 per month (in January and February), to 2.903 million m^3 per month in March. The median lowflow requirement in March is 0.292 million m^3, equivalent to a flow of 109 L/s.

WATER USERS

Irrigated agriculture is the biggest single user of water in the Gouritz River Catchment, estimated to use about 83% of the water requirements. The construction of illegal barriers in the lower reaches of the river also prevent freshwater from reaching the estuary and all the farms bordering the river pump water whenever it is available.

WATER BALANCE

Comparison of water availability and water requirements in 2000 indicates that that demands exceed availability. The efficiency of irrigation in some areas is very low, and substantial losses occur in some distribution networks. Water use by alien vegetation is also high.

WATER STORAGE

The total reservoir capacity within the catchment is estimated at 274.8 million m^3, equivalent to 49% of the nMAR. However, a significant proportion of the capacity comprises sediment accumulation. The largest dams are located about 200 km upstream of the estuary. This means that the feasibility of releasing low flow estuarine requirements from existing dams is remote. Existing large dams could however play an important role in providing high flow requirements for the estuary.

WATER QUALITY

Water quality in the lower reaches of the Gouritz River is poor and unacceptable for most uses because of naturally high levels of salinity. Despite this, the Present Ecological State of the river is moderate, and this indicates that organisms have adapted to the high salinities.

CLASSIFICATION, ECONOMIC VALUE, PROTECTION AND REHABILITATION

CLASSIFICATION

The Gouritz is a warm temperate, medium/large permanently open, tidally dominated, barred estuary that displays a moderate ichthyofaunal community, good water quality and only moderate aesthetic appeal; overall condition has been rated as Good. The Gouritz estuary is not ranked in the top 40 estuaries in South Africa, with ratings based on a combination of scores given to size, habitat importance, zonal type rarity and biodiversity importance.

ECONOMIC VALUE

Subsistence - ranked 16th amongst temperate systems; valued at R137 867 per annum.
Property – not ranked in the Top 20 in terms of property value related to estuaries; most systems fall into the R10 – 50 million range.
Tourism – not rated in the Top 20 in terms of tourism value attributed to estuaries; most (probably including the Gourits) are between R10 000 and R1 million.
Nursery – not rated in the Top 20 in terms of nursery value attributed to temperate estuaries but valued at between R1 and R5 million per annum.
Existence – is not ranked amongst the Top 40 temperate estuaries and only has a rating of Medium; existence value is largely associated with scenic beauty.
Recreational – estimated at between R10 and 20 million per annum based largely on property value.

PROTECTED AREA STRATEGY AND POTENTIAL

The following can be said about the Gouritz estuary with regards to requirements in terms of protection:

- The Gouritz is one of the core set of temperate estuaries required to meet the targets for biodiversity protection of estuarine resources; scores (out of 100) that contributed to the overall rating of 75 for the Gouritz were size (90), habitat importance (60), zonal type rarity (20) and biodiversity importance (88).
- The recommended extent of sanctuary protection is HALF the system.
- The recommended extent of undeveloped margin is 50%.
- The recommended minimum water requirement falls under the A/B management class which means a high priority and requirement.
- The priority for rehabilitation is HIGH.

Preliminary thoughts on a zonation plan for the Gouritz are that a sanctuary area be declared above the low road bridge and that the remainder of the estuary be declared a conservation zone which will further be divided into specific management areas. The proposed sanctuary area would only comprise the estuary itself and not the adjacent land as this is mostly highly elevated above the channel. The rationale behind the sanctuary is the protection of a nursery area for juvenile fish such as dusky kob, white steenbras and spotted grunter. The conservation zone, which makes up most of the estuary, will comprise areas where activities are regulated to prevent over-exploitation, to ensure responsible non-consumptive recreational use and to ensure sustainable development.

Saltmarsh does not comprise a significant portion of estuarine habitat and is largely confined to the lower reaches. Large portions of what once was pristine saltmarsh have now been altered by farming activities and no longer fulfill their original function. Saltmarsh areas will need to be rehabilitated and this will require a change in mindset and farming practices. Mudbanks and sandbanks are found along much of the lower/middle and upper reaches respectively. Mudbanks do not need any special protection status and a portion of the sandbanks in the upper reaches will be protected within the proposed sanctuary area.

The greater catchment area is generally considered to be in good condition but there are serious issues relating to water supply and abstraction and soil erosion leading to increased sediment loads. The area will benefit through the Gouritz Initiative, but this may take some time. It is imperative that a dedicated catchment management plan run through a catchment management agency be implemented so that estuary-specific issues that rely on good

catchment management can be addressed. The EWR or ecological reserve needs to be determined as a matter of urgency and then a programme initiated that will ensure measured releases and pulses of freshwater that will not only help sustain farmers in the lower river regions but also help sustain ecological processes.

RESTORATION/REHABILITATION

Thirty-nine temperate estuaries, including the Gouritz have been given a HIGH priority status for rehabilitation. Requirements for rehabilitation on the Gouritz estuary are water quantity and the clearing of alien vegetation.

THE WAY FORWARD: OBJECTIVE II

This final section of the report provides a summary of what is to be accomplished in Phase II of the project, namely the formulation of the EMP. It provides details of what is required in terms of forming a local management institution which will be responsible for the implementation and long-term running of the EMP.

A description of the tasks to be undertaken during Phase II is provided. Essentially these tasks fulfil the requirements for formulating an EMP in accordance with the C.A.P.E. Generic Framework for EMPs. These include the setting of a Vision, Strategic Objectives and Management Strategies, preparing an Estuarine Zonation Plan and associated Operational Objectives, identifying Management Action Plans, proposing an institutional structure and time-table for implementation, developing a monitoring and evaluation programme, and finally the identification of research priorities.

STAKEHOLDER WORKSHOP

A stakeholder workshop will be held at the Public Library in Gouritsmond on the 25th November 2008 and will concentrate on the development of a vision, strategic objectives and management strategies for the Gouritz estuary. A preliminary Estuary Zonation Plan (EZP) will also be presented and discussed in relation to the management strategies; the EZP will be adapted according to the outcomes of the workshop. In order to provide stakeholders attending the workshop with some idea of what to expect, some useful background information is supplied in Section 12.3 of the report.

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

Plate 7.2 The existing slipway and car park (top left); the old slipway (top right); the two boathouses and slipway located on the west bank in the middle reaches with bank erosion (bottom left and right).

Plate 7.3 The existing low bridge over the Gouritz estuary with stabilizing materials that alter the flow dynamics (left) and the remnants of the original bridge washed away by the 1981 flood waters (right).

Plate 7.4 Erosion of a section of the eastern bank in the middle reaches (left) and stabilization attempts using gabions with the resultant downstream erosion (right).

Plate 7.5 Two pumps located in the lower region of the river (top left); water pipelines that span the width of the estuary in the middle reaches (top right); and a protected pipeline running alongside the middle reaches of the estuary (bottom).

1. INTRODUCTION

Estuarine ecosystems are not isolated systems. They form an interface between marine and freshwater systems and are part of regional, national and global ecosystems either directly via water flows or indirectly through the movement of fauna. In addition to the biota that these estuaries support, they provide a range of goods and services (uses) to the inhabitants of the various regions. Disturbances in one estuary can influence a wide variety of habitats and organisms in the broader freshwater or marine ecosystem. Thus, the interaction between the systems and users creates a delicate balance, the sustainability of which needs to be addressed by some form of management plan.

In order to address this balance in a consistent manner in the Cape Floristic Region (CFR), the Cape Action for People and the Environment (C.A.P.E.) Estuaries Management Programme has developed a holistic and inclusive management process representative of all stakeholders. The programme is governed by a Task Team comprising of officials from C.A.P.E., Cape Nature, Marine and Coastal Management (MCM), the Department of Water Affairs and Forestry (DWAF), the Eastern Cape Parks Board (ECPB) and the Council for Scientific and Industrial Research (CSIR), which heads the technical support group.

The urgent need for Estuarine Management Plans (EMPs) became apparent during the development of the new Integrated Coastal Management Bill. Estuaries and the management thereof have not been adequately addressed by past marine, freshwater and biodiversity conservation Acts. Estuaries and estuaries management have been marginalized due to the fact that they do not fit the ambit of any one government Department. Estuaries and the management thereof now form an integral part of the new Integrated Coastal Management Bill which outlines a National Estuarine Management Protocol. The protocol identifies the need for the development of EMPs, as these would help to align and coordinate estuaries management at a local level.

Approximately 62 estuaries exist within the CFR. These vary from small relatively simple systems to large complex systems. In order to create a focal area within which the programme could be initiated, six priority estuaries were identified on the following six rivers: the Olifants, Breede, Heuningsnes, Klein, Knysna and Gamtoos. EMPs were formulated for all these systems in 2007 and are currently in the process of being implemented. The C.A.P.E. Estuaries Management Programme now wishes to expand this project to include additional estuaries in the CFR.

Enviro-Fish Africa (Pty) Ltd. has been contracted by Cape Nature to address the development and implementation of an EMP for the Gouritz estuary. This report fulfills the requirements of Objective 1, namely a Situation Assessment, and is presented in the form of a State of Play or SOP Report.

2. TERMS OF REFERENCE

OBJECTIVE 1: SITUATION ASSESSMENT

The consultant is expected to review all existing local information in the form of local research reports and management processes. This information can be obtained from Local Authorities and forums. A map of the estuary should be developed identifying different habitats and potential and existing management zones. The map should identify and record all

developments in at least a 500m zone surrounding the estuary. The possible direct impacts of these and other local developments should be noted.

The description of the current situation should include information on:

- Legal requirements relevant to the specific estuary
- Requirements stipulated under existing institutional Management Strategies such as Catchment Management Strategies, IDP (including SDF and Water Development Services Plan), Ramsar & National Heritage Site Strategies, Protected Area & Conservation Plans (C.A.P.E. Estuaries) relevant to the specific estuary
- the Biophysical environment (present ecological health and Important physical processes)
- the Socio-Economic environment (e.g. demographics & economic profile, land-use and planning provisions, cultural & heritage resources, water supply & demand, waste management etc.)
- Conservation Planning
- The Exploitation of living resources
- Mariculture activities
- Resource Directed Measures, e.g. Classification, Reserve and RQO
- Current institutional structures governing estuarine issues

The estuary should be represented spatially in the form of a GIS Map indicating the following:

- Important biophysical features
- All protected/conservation areas
- Areas earmarked for rehabilitation
- Land-use and planning provisions of surrounding lands
- Infrastructure
- Cultural & heritage sites
- Recreational activities
- Living resource exploitation
- Mariculture activities
- Wastewater discharges
- Stormwater drains
- Solid waste dump sites.

Finally, an assessment of the opportunities and constraints (e.g. legal obligations, constraints of tenure, prior usage, health and safety, natural hazards) should be done to guide the development of the EMP.

3. PROJECT TEAM

Overall responsibility for the project lies with Enviro-Fish Africa (Pty) Ltd. The project and team will be managed by Dr Tim Andrew of EFA; Dr Aidan Wood from Gleneagles Environmental Consulting CC is the project coordinator and will also provide specialist input with regards living resource exploitation and bio-physical & socio-economic aspects; Dr Rob Palmer from Nepid Consultants will provide specialist input with regards the catchment, water use and water requirements; and Mr Russell Chalmers from EFA will be responsible for all mapping and GIS work.

4. BIO-PHYSICAL DESCRIPTION

4.1 PHYSICAL DESCRIPTION (see also Section 9)

The catchment that supplies the Gouritz river is extensive, being the third largest in South Africa, and drains an area in excess of 45 000 km^2. Mean annual precipitation is 262 mm and the MAR is 695 x 10^6 m^3 (DWAF 2007). The catchment covers six eco-regions, namely Great and Nama (Little) Karoo, Southern and Western Folded Mountains and the South-Eastern and South-Western Coastal Belt. The main tributaries feeding into the Gouritz river are the Olifants in the east, the Gamka in the north and the Groot in the north-west. The remaining rivers which comprise smaller tributaries within the greater catchment are the Touws, Buffels, Dwyka, Koekemoers, Leeuw and Kammanassie. The geology of the catchment, which influences water quality, comprises karoo sediments and doleritic intrusions; sandstones and quartzite of the Table Mountain Group; Bokkeveld Group sandstone and shale; and conglomerates of the Malmesbury group overlain by alluvial deposits in the valley floors (DWAF 2007). Vegetation consists of temperate and transitional forest and scrub; and Karoo and karroid, false Karoo, sclerophyllous and false sclerophyllous bush. Main land-uses in the catchment are irrigated agriculture (lucerne, pasture and grains for cattle feed, fruit, vineyards and vegetables), livestock (sheep, goats, ostriches and cattle) and some conservation areas. According to 1995 census data, close to 170 000 people inhabit the catchment area, the majority of which are concentrated in urban areas. According to the DWAF State of the Rivers Report (DWAF 2007) which is part of the National River Health Programme, the majority of rivers and tributaries are in a good to fair state, with only the lower Olifants west of Oudtshoorn and the Buffels river at Laingsburg being classed as poor.

The Gouritz estuary (35º21'S; 21º53'E) is a medium/large (188 ha), permanently open system, entering the sea through a shallow dynamic mouth region which shifts according to tidal and freshwater flood regimes (Plate 4.1). Geographically the estuary lies in the warm-temperate southern Cape region approximatley 33 km to the south-west of Mossel Bay and enters the Indian Ocean between Bull Point and Kanonpunt. The coastal town of Gouritsmond lies immediately to the west of the mouth and the resorts of Kanon, Fransmanshoek and Vleesbaai lie to the east. According to Harrison *et al.* (2000) the Gouritz estuary is a Type F Barred system which means it is characterized by a supratidal barrier at the mouth and has a MAR of <15 x 10^6 m^3. Net longshore transport of sediment at the mouth as a result of the dominant south-westerly swells is towards the east and as such the sandspit (barrier) tends to form from the west. Depth at the mouth ranges from 0.5 to two meters at high tide, while main channel depth has been measured between 1.3 and four meters, with the deepest site of six meters located near the road crossing. The system is mostly marine dominated but severe flooding from the inland catchment occurs from time to time (e.g. August 1971, March 1974, March & June 1976, April & May 1977, January 1981 and August 1986). At these times the mouth can measure up to 100 m across and rocky platforms are exposed on the western side (Heydorn 1989).

The mouth region is dominated by a steep bank with a rocky headland on the east and an extensive mobile sandspit on the west (Plate 4.1). The banks for the most part of the middle to upper reaches are gently sloping but the extreme upper reaches are characterized by steep-sided banks on both sides (Heydorn 1989). The estuary extends a maximum of 10 km from the mouth when freshwater flows are at a minimum and tidal influences are dominant. A bridge spans the estuary eight km from the mouth at Die Eiland. Degradation of the estuary due to coastal developments, off-road driving, trampling of riparian habitats, modified or

altered habitats and channels, livestock grazing and planting of crops close to the edge that cause bank collapse, erosion and increased sediment loads, nutrient enrichment from agricultural practices, invasive alien plants and fish, and weirs and abstraction activities that obstruct/alter flow dynamics, is cause for concern. Harrison *et al.* (2000) rate water quality and aesthetics in the Gouritz estuary as good and moderate respectively.

Plate 4.1 The permanently open mouth region of the Gouritz estuary showing the steep rocky headland on the east and the large mobile sand spit on the west.

Considerable amounts of sediment are carried into the estuary from the catchment and riparian farmlands during periods of heavy rainfall but this is not thought to pose a threat to the system because it is flushed out to sea. The sediment forming the barrier at the mouth and the tidal delta is predominantly marine and Aeolian in origin being carried into the estuary by flood tides or blown by strong winds. The flood-tide delta at the mouth builds up between periods of high flow but is washed out to sea during floods and deposited on an offshore delta; this delta forms a major source for sediment washed back into the estuary on the flood tide when high flows subside. It is worth mentioning that should periodical flooding be prevented via the construction of additional impoundments and abstraction activities, the build-up of the flood-tide delta and barrier may eventually lead to the closure of the mouth. At present several farmers are talking about an additional dam either at the start of the gorge or even on the Weyersrivier (this dam was originally proposed in 1968 and an application submitted to the Minister of Water Affairs; Anon. 1968).

Physico-chemical characteristics of the estuary are not well documented but limited historical data for salinity and oxygen concentrations indicates good mixing except in the upper reaches when freshwater runoff causes stratification (Heydorn 1989). Water samples taken at three sites in June 2001 (Allanson 2001) revealed a marine dominated system with salinities

ranging from 34 ppt at the mouth to 23.3 ppt at the road bridge eight km upstream. Recent monitoring of salinities has shown that freshwater pulses have become weaker and infrequent and confirmed that marine influences are strong (Lara van Niekerk, CSIR, Pers. Comm.). Periodical construction of barriers above the road bridge isolates the estuary from the river and results in the breakdown of the river-estuarine-interface (REI). When these barriers are absent, tidal waters may push eight to ten kilometers upstream of the bridge during high equinox spring tides; this is, however an infrequent occurrence.

4.2 BIOLOGICAL DESCRIPTION

4.2.1 Phytoplankton

There is no data on phytoplankton in the Gouritz estuary.

4.2.2 Algae and aquatic vegetation

Marine algae appear to be restricted to the rocky platforms on the eastern bank in the mouth region; two species have been recorded, namely *Porphyra capensis* and *Sargassum heterophyllum* (Heydorn 1989).

Submerged macrophytes are not well represented in the system and there are conflicting reports of isolated *Zostera capensis* beds on some mudbanks; none was observed during the September field survey. It is thought that periodic flooding and high turbidity are limiting factors in this respect.

Saltmarshes (see Figure 4.1; Plate 4.2) and their associated flora are not extensive but are dominated by *Sarcocornia perennis, Chenolea diffusa, Cotula coronopifolia, Disphyma crassifolium, Sporobolus virginucus* and *Salicornia meyerana* in the areas close to the mouth and near to the water. In the middle to upper reaches, saltmarsh vegetation is represented by *C. coronopifolia, Triglochin* spp. and *Sarcocornia* sp. Further away from the water a transition zone between the terrestrial vegetation types comprises *Juncus kraussii, Stenotaphrum secundatum* and *Suaeda caespitosa*. A single rare species (*Reihania garnotii*) is confined to this community (Heydorn 1989; Purves *et al.* 2006).

Large patches of *Spartina maritima* (Plate 4.2) are found semi-submerged along the waters edge but not always in association with other saltmarsh plants. The flora associated with areas of freshwater seepage is dominated by *Juncus acutus, J. kraussi* and *Phragmites australis*.

4.2.3 Zooplankton

There is no data on zooplankton in the Gouritz estuary.

4.2.4 Aquatic invertebrates

The mudprawn (*Upogebia africana*) is found on all mudbanks on the east and west side of the estuary between "Steentjie se Gat" in the lower reaches and "Bar se Gat" in the upper reaches of the estuary. Sandprawns (*Callianassa kraussii*) are found on sandbanks from about 6.5 km from the mouth to areas well beyond the Road Bridge and Die Eiland (Plate 4.3). Bloodworm (*Arenicola loveni*) and pencil bait (*Solen* sp.) has been found in the past, but both species were considered rare then and appear to be absent now. Although the swimming crab (*Scylla serrata*) is found in the estuary, the numbers, particularly in recent times, are low and individuals seem to be small.

Plate 4.2 Saltmarsh and *Spartina maritima* along the east bank in the middle reaches upstream from the slipway.

4.2.5 Fish

The rivers of the Gouritz catchment feature six indigenous freshwater species, of which at least two (*Pseudobarbus asper* and *P. tenuis*) are endangered/threatened. Several eel species are also present, but these are strictly speaking catadromous as adults migrate to sea to spawn. These indigenous fish are threatened by invasive fish and plant species, habitat destruction/alteration, water abstraction and pollution/water quality issues. Invasive fish in the catchment include *Tilapia sparrmanii, Cyprinus carpio, Micropterus salmoides* and *Clarias gariepinus*. These alien species impact negatively on the system and the indigenous fish via predation, competition for food and space and habitat destruction.

Until recently a detailed ichthyofaunal survey of the Gouritz estuary had not been conducted, and only eleven species were recorded during the River Health Programme study (DWAF 2007). These were *Gilchristella aestuaria, Mugil cephalus, Myxus capensis, Liza richardsoni, L. dumerilii, Atherina breviceps, Monodactylus falciformis, Solea bleekeri, Lichia amia, Psammogobius knysnaensis* and *Lithognathus lithognathus*. Earlier surveys also found *Argyrosomus japonicus, Pomatomus saltatrix, Pomadasys commersonnii, Galeichthys feliceps, Rhabdosargus globiceps, R. holubi* and *Caffrogobius multifasciatus* (see Heydorn 1989; Harrison 1999). Recently, Steve Lamberth (DEA&T:MCM) has been conducting annual monitoring of the fish fauna using seine nets. He concluded that the estuary had a rich ichthyofauna dominated by dusky kob, spotted grunter, white sea-barbel, white steenbras and leervis. Several of these species, most notably *A. japonicus* and *L. lithognathus*, are endangered; stocks are in a state of collapse due to fishing pressure. There are no records of teleost larval fish.

Plate 4.3 Sandbank at Die Eiland just above the Road Bridge showing sandprawn (*C. kraussii*) holes. Note also the steep and eroded east bank in the background.

Angler reports from a recent snapshot survey (8th – 11th September 2008) suggest that adult dusky kob (> 100 cm) are found in the lower and middle reaches of the estuary, shad (*Pomotomus saltatrix*) occur in the lower reaches, while spotted grunter, leervis and mullet species are found throughout the river. Juvenile fishes, mostly dusky kob, white steenbras and spotted grunter are most frequently encountered in the upper reaches (7 km and above) of the estuary. Farmers up to 18 km upstream of the estuary mouth regularly observed mullets in the river (probably *Myxus capensis* and *Mugil cephalus*).

Anglers also report that elasmobranch species have been captured, although not regularly, near the estuary mouth. These include the diamond ray (*Gymnura natalensis*), eagleray (*Myliobatus aquila*), and lesser sank shark (*Rhinobat*os *annulatus*).

4.2.6 Reptiles and amphibians

A list of reptiles and amphibians recorded in the planning area and environs has been compiled by ME and AL de Villiers of the CDNEC. Eleven amphibians were recorded, three tortoises, 26 snakes and 12 lizards, none of which are rare or endangered species (from DMP 2004).

4.2.7 Birds

Historical records indicate that there were three bird surveys on the Gouritz estuary pre 1985. Summers *et al.* (1976) surveyed waders only and reported 292 birds from 12 species of which 35 (comprising two species; whitefronted plover and Kittlitz's plover) were residents and 257

migrants (including ringed plover, turnstone, grey plover, curlew sandpiper, little stint, knot, terek sandpiper, greenshank, bar-tailed Godwit and whimbrel). At the same time at the nearby Voëlvlei on the eastern side bird numbers were more abundant with 468 waders being counted with only one (Kittliz's plover) being resident. Underhill and Cooper (1982; 1983) counted birds on the Gouritz in July 1980 and January 1981. In July 1980 17 species were counted totaling 158 birds, with the most abundant being kelp gulls followed by swift terns and whitefronted plovers. In January 1981 36 species (totaling 625 birds) were recorded and were dominated by the summer migrants such as the curlew sandpiper, terek sandpiper, ringed plover, greenshank, little stint and whimbrel. Based on these surveys it seems clear that the estuary is extensively utilized by summer migrant species, and the habitat occupied by these birds, especially the waders, needs to be conserved.

More recently the Animal Demography Unit's (ADU) Coordinated Waterbird Counts (CWAC) has compiled data for the Gouritz since 2000 from the mouth region to the Low-water Bridge (Site Code – 34212153). The following CWAC data were obtained from the ADU, University of Cape Town; the data is owned by Cape Nature and the source is from various compilers.

Between October 2000 and July 2007, ten counts were conducted by the CWAC programme and a total of 57 species identified (Table 4.1). Of these, 28 species were only seen on three or less occasions and 13 species are represented by between one and three individuals. Kelp gulls are by far the most abundant species followed by the Egyptian goose and swift terns. Numerically the most birds were counted in October 2000, with 782; no other year has come even close to matching this with the next highest number being 446 in January 2004.

Breeding activity has only been confirmed for three species, namely the Egyptian goose (January 2004 and January & August 2005), African fish eagle (January and August 2005) and Black harrier (August 2005).

The CWAC data comprises only those species associated with the estuarine area and excludes all "terrestrial" birds, including the European and Pied starlings that are found nesting in the steep-sided eroded banks of the estuary.

4.2.8 Mammals

There are no records of mammals directly associated with the estuary although 80 species, including the Cape clawless otter, are thought to occur in the region, including the catchment (Heydorn 1989). Of these, eight species are listed as being rare or vulnerable (from DMP 2004), namely the Honey badger (*Mellivora capensis*), African wild cat (*Felis lybica*), leopard (*Panthera pardus*), Antbear (*Orycteropus after*), White-tailed mouse (*Mystromys albicaudatus*), Spectacled doormouse (Graphiurus *ocularis*), White-naped weasel (*Poecilogale albinucha*) and Aardwolf (*Proteles cristatus*). Conservation Management Services (2008) listed the following species that are known to occur in the general area; bushbuck, common duiker, grysbok, caracal, several mongoose species, large-spotted genet and porcupines. Burrows belonging either to the Cape molerat or Cape golden mole were evident along most of the riparian area of the estuary and lower river during the September 2008 field trip.

4.2.9 Terrestrial Vegetation

The following description of vegetation types associated with the middle to lower reaches of the estuary (Figure 4.1) has been taken from Heydorn (1989) and DMP (2004).

Table 4.1 CWAC data for the site 34212153 (Gouritz Mouth – Low-water Bridge) for the period October 2000 to July 2007.

Species	Oct 2000	Jun 2001	Jun 2002	Jan 2004	Aug 2004	Jan 2005	Aug 2005	Jul 2006	Feb 2007	Jul 2007	TOTAL
African (Ethiopian) Snipe	1										**1**
African Darter		5	5				10	1		1	**22**
African Fish-Eagle				1		4	2	1			**8**
African Spoonbill								1		2	**3**
Arctic Tern						21					**21**
Bank Cormorant					5						**5**
Black Harrier							1				**1**
Black-headed Heron						1					**1**
Blacksmith Lapwing (Plover)	4				5	8	4	6	7	2	**36**
Cape Cormorant	4	27	27		8		9	1		6	**82**
Cape Shoveler					2						**2**
Cape Teal	17	4	4		6		8			4	**43**
Cape Wagtail	2				15	5	1		4	9	**36**
Caspian Tern		2	2		1	3	7	1			**16**
Common Whimbrel	20	2	2	10	5	6	5	2	6		**58**
Common Greenshank	38	1	1			29	2		27	11	**109**
Common Ringed Plover	33			36		15	21				**105**
Common Sandpiper				2		3					**5**
Common Tern				4			2		1		**7**
Crowned Cormorant					6						**6**
Curlew Sandpiper	39					26					**65**
Egyptian Goose	106	67	67	180	9	33	17	16	61	2	**558**
Eurasian Curlew				2		2					**4**
Giant Kingfisher		1	1		3		1	4			**10**
Great Crested Grebe		1	1					1			**3**
Grey (Black-bellied) Plover		3	2	22		15			9	2	**53**
Grey Heron	8	4	4	4		3		3		3	**29**
Grey-headed Gull								4			**4**
Hadeda Ibis		9	9		21	46		17			**102**
Hartlaub's Gull				2				3			**5**

Table 4.1 continued.

Species	Oct 2000	Jun 2001	Jun 2002	Jan 2004	Aug 2004	Jan 2005	Aug 2005	Jul 2006	Feb 2007	Jul 2007	TOTAL
Hottentot Teal										2	**2**
Kelp Gull	239	45	45	58	81	69	67	123	203	132	**1062**
Kittlitz's Plover		1	1	2	32	10		3			**49**
Little Egret	3	3	3		5	1	2	4		2	**23**
Little Grebe (Dabchick)		4	4								**8**
Little Stint	47			10					3		**60**
Malachite Kingfisher								1			**1**
Marsh Sandpiper	5			55	15	6	18	8			**107**
Osprey									1		**1**
Pied Kingfisher		2	2	3	5	8	5	2		2	**29**
Red Knot	13										**13**
Red-billed Teal (Duck)								2			**2**
Reed (Long-tailed) Cormorant	4				6		1	1			**12**
Sanderling				16							**16**
Sandwich Tern	108			9		3					**120**
South African Shelduck							5	1			**6**
Spur-winged Goose		25	25					5		6	**61**
Swift (Great Crested) Tern		22	22	5	14	50	12	3		70	**198**
Terek Sandpiper				2		22		2	6		**32**
Three-banded Plover	83	2	2		1		6	2	3		**99**
Unidentified Ducks							1				**1**
Unidentified Terns								2			**2**
Water Thick-knee (Dikkop)		1	1								**2**
White-breasted (Great) Cormorant	6	12	12	13	32	15	11	29	6	12	**148**
White-fronted Plover		7	7	10	16	15	10	16	14	16	**111**
Yellow-billed (Intermediate) Egret		3	3								**6**
Yellow-billed Duck	2	15	15		2		4				**38**
TOTAL	**782**	**268**	**267**	**446**	**295**	**419**	**232**	**265**	**351**	**284**	**3609**

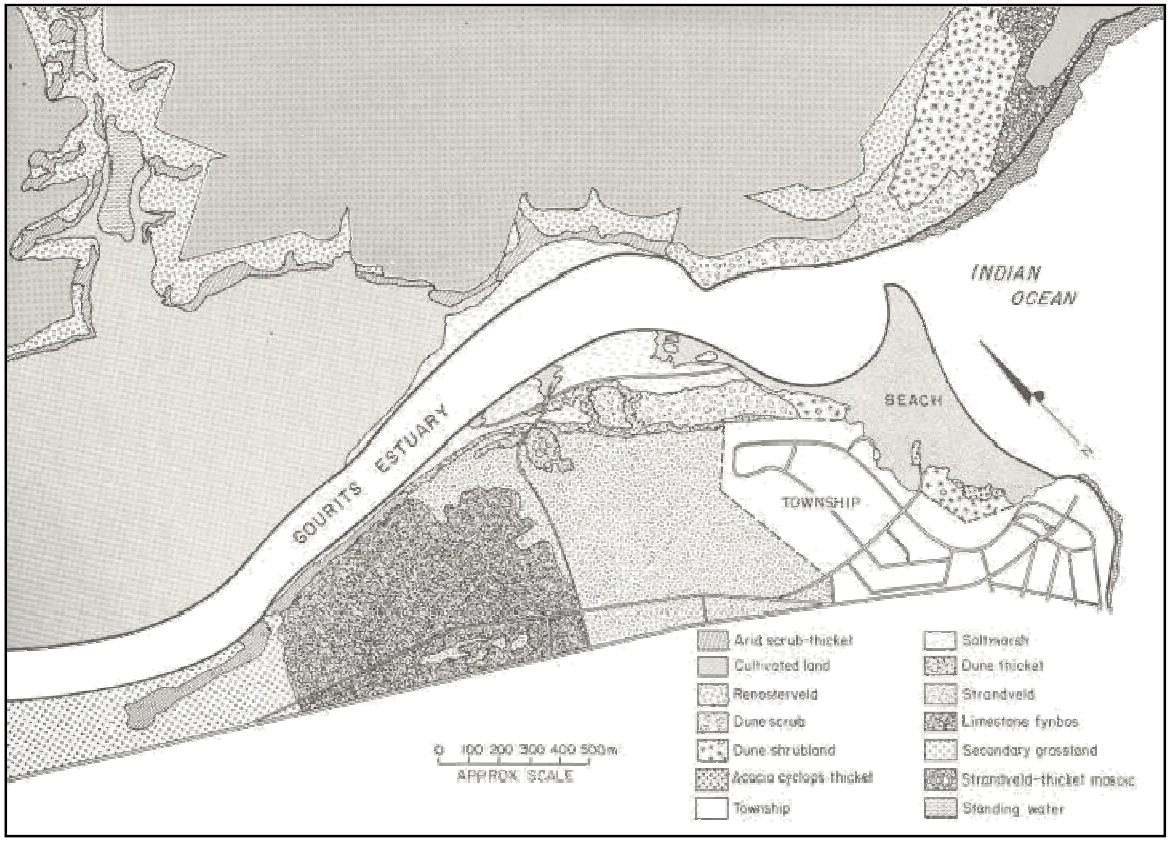

Figure 4.1 Vegetation types and distribution in the middle and lower reaches of the Gouritz estuary (from Heydorn 1989).

Arid scrub thicket

This mapping unit is limited to the lower slopes of the incised embankment of the river valley. On the east bank, it occurs below renosterveld and has a more scrub-like appearance, while on the west bank, it occupies a similar position as thicket below limestone fynbos. It has a generally degraded appearance due largely to domestic stock. *Sideroxylon inerme* and *Euclea racemosa* are the important tree species, while aloes can be locally conspicuous.

Renosterveld

The areas which have been mapped as renosterveld represent relict patches of what was once an extensive vegetation type in the region to the east of the estuary. Most of the vegetation has been cleared for crops and the remaining areas are located on slopes which are considered to be too steep for cultivation. The species composition is dominated by *Elytropappus rhinocerotis*.

Strandveld

The area which has been mapped as strandveld consists of a mosaic of bushclumps, restois and shrubs, with a conspicuous graminoid and herbaceous ground layer. The bushclumps are dominated by *Sideroxylon inerme*, *Schotia afra* and *Pterocelastrus tricuspidatus*. The restio *Thamnochortus bachmannii* together with *Chrysanthemoides manilifera* and *Phylica axillaries* var. *maritime* are conspicuous in the more open area of vegetation.

Strandveld – thicket mosaic

This mapping unit occupies much of the Kanonpunt peninsula and is in a relatively well preserved state. Tinley (1985) describes this community as dwarf scrub-thicket. The dominant woody species include *Euclea racemosa*, *Sideroxylon inerme* and *Rhus longispina*, while *Zygophyllum morgsana* is the dominant scrub in the area mapped.

Dune scrub

A narrow belt of this vegetation type occupies the mantle of dune sand which has been deposited on the lower spoles of the eastern and western banks of the estuary, close to the mouth. Dense scrub, dominated by Euclea racemosa alternates with a lower and sparser ground cover of herbaceous lementes such as *Tetragonia decumbens*, *Trachyandra divaricata*, *Silvia Africana-lutea* and *Restio eleocharis*.

Dune scrubland

Small areas of open dune scrubland occur on both banks of the estuary at the mouth, where the vegetation provides a degree of stability to previously mobile sand. Dominant scrub species include *Myrica cordifolia*, *Chrysanthemoides monilifera* and *Stoebe plumosa*.

Acacia Cyclops thicket

Scattered clumps of *Acacia cyclops* occur above the beach and adjacent to the parking area south of the estuary mouth. This exotic species, which has the potential to spread rapidly, should be eradicated without delay while its distribution is still relatively limited. Approximately five kilometres upstream of the mouth, the fynbos on the west bank is heavily infested with *Acacia cyclops*.

Dune thicket

Dune thicket of up to three metres in height has become established on the western bank of the estuary within the transition zone between the sub-climax dune scrub situated close to the estuary and the climax strandveld vegetation situated further landward. The presence of *Clausena anisata* is noteworthy, since the Gouritz River represents the southernmost distribution limit for this species.

Limestone fynbos

This community occurs on the calcareous quarternary sands overlying limestone of the Bredasdorp Formation, to the west of the estuary. The area mapped as limestone fynbos exhibited two structural variations as a result of fires in the past. The area between the tarred road and the old gravel road to Gouritz River mouth comprises mature protea veld which is approximately 1.5 m tall and has obviously not been burnt for a number of years. The area to the east of the gravel road, extending towards the estuary, includes a much shorter type of vegetation which is less dense and predominantly comprises restioid, ericoid and graminoid elements.

Secondary grassland

The area which has been mapped as secondary grassland has been converted to this state from fynbos by agriculture. Stock farming is practiced along the western bank of the estuary and grazing pressure and fire have encouraged grass to become established at the expense of fynbos elements.

4.2.10 Rare & endangered species

A vegetation sensitivity analysis for the farm Remainder Gansfontein No. 450 (CMS 2005), which is located to the west of the middle reaches of the estuary, revealed nine rare and endemic (to the immediate area) plant species. One of these, *Leucadendron galpinii* is also listed as a vulnerable Red Data species.

4.2.11 Alien vegetation

The predominant alien plants in the lower estuarine area are rooikrans (*Acacia cyclops*), gum tree (*Eucalyptus* sp.), kikuyu (*Pennisetum clandestinum*), prickly pear (*Opuntia ficus-inidica*) and manatoka (*Myoporum tenuifolium*). Alien plants in the riverine regions include Kariba weed (*Salvinia molesta*), red water fern (*Azolla filiculoida*) and Spanish reed (*Arundo donax*) (DWAF 2007; CMS 2008).

4.3 HERITAGE RESOURCES

Historically the region was largely inhabited by nomadic hunters and more recently by Khoi pastoralists (Heydorn 1989). Evidence of this can be seen in the many shell middens (some containing pottery artifacts) and stone tidal fish traps (visvywers) along the coastal region. Several of these heritage resources are present in the vicinity of the Gouritz mouth and neighbouring resorts.

5. LEGISLATION PERTAINING TO ESTUARINE MANAGEMENT

The purpose of this section is to review all forms of legislation that may have an impact on the management of the Gouritz estuary. This review incorporates international agreements and strategies as well as all forms of national, regional and local legislation.

5.1 INTERNATIONAL OBLIGATIONS (Table 5.1)

Table 5.1 Summary of International obligations and their relevance to estuarine management.

International Obligations	Short Description
Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971) (Ramsar Convention)	The broad aims of this Convention are to stem the loss and to promote wise use of all wetlands (including estuaries).
Agenda 21 (1992) as reaffirmed at the United Nations World Summit on Sustainable Development - Johannesburg Summit (2002)	This is not a legally binding document, but Agenda 21 is an internationally accepted strategy for sustainable development; the principles of sustainable development are easily applied to the estuarine scenario.
United Nations Convention on Biological Diversity (1992)	The objectives of convention include the conservation of biological diversity; the sustainable use of biological resources; and the fair and equitable sharing of benefits arising from the use of genetic resources.
United Nations Framework Convention on Climate Change (1992)	This framework sets an "ultimate objective" of stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. This has particular relevance to estuaries when

	considering changes in rainfall, storm severity and flood levels and frequencies.
Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) (1995)	The GPA is designed to assist states in taking action to prevent, reduce, control or elimination the degradation of the marine environment (including estuaries), and to assist in its recovery or rehabilitation from the impacts of land-based activities.

5.2 NATIONAL LEGISLATION (Table 5.2) AND POLICY (Table 5.3)

Table 5.2 Summary of national legislation and its relevance to estuarine management in general and the Gouritz in particular. OBJ = Setting Resource Objectives; L&D = Land-use and Infrastructure Development; WQQ = Water Quantity and quality; ELR = Exploitation of Living Resources (from Taljaard 2007).

National Legislation	Lead Agent	Short Description	Relevance to the Gouritz Estuary			
			OBJ	L&D	WQQ	ELR
National Environmental Management: Biodiversity Act (Act 10 of 2004)	DEAT	This Act provides for the conservation of biological diversity, regulates the sustainable use of biological resources and ensures a fair and equitable sharing of the benefits arising from the use of genetic resources.	X	X	X	X
National Health Act (No. 61 of 2004)	Delegated to Provincial and Local authorities from Department of Health	Delegated to Provincial and Local authorities from Department of Health			X	
National Environmental Management: Protected Areas Act (Act 57 of 2003)	DEAT	This Act provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas.	X	X	X	X

Table 5.2 continued

National Legislation	Lead Agent	Short Description	Relevance to the Gouritz Estuary			
			OBJ	L&D	WQQ	ELR
Disaster Management Act (No. 57 of 2002)	Act is administered by a Cabinet member designated by the President	To provide for an integrated and coordinated disaster management policy that focuses on preventing or reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recovery; the establishment of national, provincial and municipal disaster management centers; disaster management volunteers; and matters incidental thereto		X	X	
Local Government: Municipal Systems Act (Act 32 of 2000)	Department of Provincial and Local Government	This Act deals with Integrated Development Planning (IDP), which is intended to encompass and harmonize planning over a range of sectors such as water, transport, land use and environmental management.	X	X	X	X
Development Facilitation Act (Act 67 of 1995)	Same	This Act requires the setting of Land Development Objectives and the principles of this Act have also been incorporated into the Municipal Systems Act.	X	X	X	X
Local Government Transition Second Amendment Act (Act 97 of 1996)	Same	This Act requires that all municipalities, local and district councils, draw up IDPs for the integrated development and management of their areas of jurisdiction.	X	X		
Local Government Municipal Structures Act (No. 117 of 1998, amended by Act 33 of 2000)	Same	This Act provides for "the establishment of municipalities in accordance with the requirements relating to categories and types of municipality; to establish criteria for determining the category of municipality in an area" and other related matters.	X	X	X	X
National Environmental Management Act (Act 107 of 1998)	DEAT	This Act provides for the conservation of biological diversity, regulates the sustainable use of biological resources and to ensures a fair and equitable sharing of the benefits arising from the use of genetic resources.	X	X	X	X

Table 5.2 continued

National Legislation	Lead Agent	Short Description	Relevance to the Gouritz Estuary			
			OBJ	L&D	WQQ	ELR
National Environmental Management: Integrated Coastal Management Bill A & B	DEAT (Marine & Coastal Management)	This Bill aims to establish a system of integrated coastal and estuarine management in South Africa, including norms, standards and policies, to promote the conservation of the coastal environment, the ecological sustainable development of the coastal zone, to define rights and duties in relation to coastal areas, to determine responsible organs of state in relation to coastal areas and to give effect to South Africa's international obligations in relation to coastal matters and to provide for related matters.		X	X	
National Veld and Forest Fire Act (No. 101 of 1998)	DWAF	Sets out to reform the law on veld and forest and provides for matters relating to fire protection, and fighting, offences and penalties and enforcement.			X	
National Water Act (Act 36 of 1998)	DWAF	This Act ensures protection of the aquatic ecosystems of water resources, including estuaries. It requires policies to be in place that provide guidance in developing resource quality objectives, i.e. specifying aspects such as freshwater inflow, water quality, habitat integrity, biotic composition and functioning requirements.	X	X	X	X
National Forests Act (No. 84 of 1998)	DWAF	This Act recognizes that natural forests and woodlands (including riparian vegetation) form an important part of the environment, and need to be conserved and developed according to the principles of sustainable management.		X		
Marine Living Resources Act (Act 18 of 1998)	DEAT (MCM)	This Act deals with the utilization, conservation and management of marine living resources, the need to protect whole ecosystems, preserve marine biodiversity and minimize marine pollution as well as to comply with international law and agreements and to restructure the fishing industry.	X			X

Table 5.2 continued

National Legislation	Lead Agent	Short Description	Relevance to the Gouritz Estuary			
			OBJ	L&D	WQQ	ELR
Water Services Act (No. 108 of 1997)	DWAF	Right of access to basic water supply and sanitation; control of water services; preparation of WSDPs.		X	X	
The Constitution (Act 108 of 1996)	National Government	The Constitution is the supreme law of the land and provides the legal framework for legislation regulating environmental management in general. The most pertinent fundamental right in the context of estuarine management is the Environmental Right which provides that: "Everyone has the right: to an environment that is not harmful to their health or well-being; and • to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that – • prevent pollution and ecological degradation; • promote conservation; and • secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.	X	X	X	X
Local Government Transition Second Amendment Act (Act 97 of 1996)	Department of Provincial and Local Government	This Act (*www.info.gov.za/documents/acts/1996.htm*) also requires that all municipalities, local and district councils, draw up IDPs for the integrated development and management of their areas of jurisdiction.	X	X		
Tourism Act (No. 72 of 1993, as amended in 1996 & 2000)	DEAT	No details.	X	X		
Development Facilitation Act (Act 67 of 1995)	Department of Provincial and Local Government	This Act requires the setting of Land Development Objectives and the principles of this Act have also been incorporated into the Municipal Systems Act.	X	X	X	X

Table 5.2 continued

National Legislation	Lead Agent	Short Description	Relevance to the Gouritz Estuary			
			OBJ	L&D	WQQ	ELR
Local Government Transition Act (No. 209 of 1993)	Department of Provincial and Local Government	To provide for revised interim measures with a view to promoting the restructuring of local government, and to provide for the establishment of Provincial Committees for Local Government in respect of the various provinces	X	X		
Environmental Conservation Act (No. 73 of 1989)	DEAT	Although many of the provisions of this Act have been repealed by NEMA, the regulation on Sensitive Coastal Areas remains in force until replaced with new regulations.	X			
Sea Fishery Act 12 of 1988	DEAT (Marine & Coastal management)	This act includes estuaries and the estuary bed and has been used to proclaim marine reserves along certain sections of our coast.				X
Conservation of Agricultural Resources Act (No. 43 of 1983)	Department of Agriculture	This Act provides for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources (including estuaries), and by the protection of the vegetation and the combating of weeds and invader plants.		X	X	
Marine Pollution (Control and Civil Liability) Act (No. 6 of 1981)	Department of Transport (prevention) and DEAT (combating)	This Act provides for the protection of the marine environment from pollution by oil and other harmful substances, the prevention and combating of such pollution.			X	
National Buildings Regulations and Building Standards Act (No. 103 of 1977)	Unknown	Sets requirements for the approval and installation of storm water drains. These regulations must be read together with the South African Bureau of Standard's code of practice, which also lays down detailed requirements for the design of storm water drainage systems.		X	X	X

Table 5.2 continued

National Legislation	Lead Agent	Short Description	Relevance to the Gouritz Estuary			
			OBJ	L&D	WQQ	ELR
National Parks Act (No. 57 of 1976)	DEAT; SANP	The National Parks Act provides for the establishment of National Parks. National Park status establishes the strongest claim to permanent protection that is possible. Areas above and below the intertidal zone may be included in a National Park.	X	X	X	X
Lake Areas Development Act (No. 39 of 1975)	DWAF	This law (rarely used since enactment) provides for the establishment of Lake Areas (which includes estuaries). The effectiveness of this law is questionable, as only two such areas have been proclaimed under it. Those Lake Areas are managed by the SANP by virtue of provisions in the National Parks Act	X	X	X	X
Sea Bird and Seal Protection Act (No. 46 of 12973)	DEAT (MCM)	This Acts governs the protection and control of the capture, killing and products produced from seabirds and seals.				X
Hazardous Substances Act (No. 15 of 1973	Department of Health and Welfare	To provide for the control (including the prevention of dumping) of substances which may cause injury or ill health to, or death, of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature.			X	
Foodstuffs, Cosmetics and Disinfectant Act (No. 54 of 1972)	Department of Health and Welfare.	In South Africa standards (i.e. concentration limits of constituents required by law) specifying the limits of chemical and microbiological constituents in the flesh of different marine organisms used for human consumption are covered under this Act and are listed as the regulation - Marine food, 2 November 1973 (re Bacteriological contamination) and the regulation related to metals and foodstuffs.			X	

Table 5.2 continued

National Legislation	Lead Agent	Short Description	Relevance to the Gouritz Estuary			
			OBJ	L&D	WQQ	ELR
Physical Planning Act (No. 88 of 1967)	Department of Provincial and Local Government	The Act provides for Guide Plans that could influence the planning and location of storm water drains.		X	X	
Seashore Act (No. 21 of 1935)	DEAT/Cape Nature	This Act provides that ownership of the seashore (which includes the water and land between the low-water mark and the high-water mark in estuaries and the sea is vested in the State.		X	X	

Table 5.3 Summary of national policies (white papers) relevant to estuarine management (from Taljaard 2007).

White Paper	Year	Short Description
White Paper for Sustainable Coastal Development in South Africa	2000	This paper sets out a policy which aims to achieve sustainable coastal development in South Africa through integrated coastal management. The key messages of the white paper are: 1) the value of the coast must be recognized, 2) sustainable coastal management must be facilitated; 3) the Coastal management must be co-coordinated and integrated; 4) the Government must adopt a co-operative style of management.
White Paper on a National Water Policy for South Africa	1997	This paper sets out the policy for the management of both quality and quantity of South Africa's water resources (including estuaries). The **National Water Act (No. 36 of 1998)** gives legal status to this White Paper.
White Paper on Marine Fisheries Policy for South Africa	1997	The White Paper sets out the main policy principles that the Department of environmental Affairs and Tourism will endeavor to implement through its marine fisheries management institutions in order to achieve this overall policy objective. The objective is to improve the overall contribution of the fishing industry to the South Africa's economy. **The Marine Living Resources Act (No. 18 of 1998)** gives legal status to this White Paper.
White Paper on Environmental Management Policy	1998	The White Paper contains the government's environmental management policy and includes an introduction that sets out the concept of environment used in the policy, the scope and purpose of the policy, new vision for environmental policy and the mission of the DEAT with respect to the new policy, policy principles that must be applied in developing and testing policy, government's strategic goals and supporting objectives to begin sustainable use of resources, government's approach to governance, setting out the powers and responsibilities of the different spheres and agencies of government and the regulatory approach to environmental management. The **National Environmental Management Act (No. 107 of 1998)** gives legal status to this White Paper.
White Paper on Spatial Planning and Land-use Management	2001	This White Paper addresses the development of policies, which will result in the best use and sustainable management of land, improvement and strengthening planning, management, monitoring and evaluation, strengthening institutions and coordinating mechanisms, creation of mechanisms to facilitate satisfaction of the needs and objectives of communities and people at local level. Sustainable land management plans should ensure that development and developmental programmes are holistic and comprehensive, all activities and inputs are integrated and coordinated, all actions are based on a clear understanding of the natural and legitimate objectives and needs of individual land users to obtain maximum consensus and institutional structures are put in place to develop debate and carry out proposals.

Table 5.3 continued

White Paper	Year	Short Description
White Paper on Integrated Pollution and Waste Management for South Africa	2002	This paper outlines a management approach that envisages pollution prevention, waste minimization, managing the environmental impacts associated with waste and pollution, remediating damaged environments and integrating the management of various sources of waste. The white paper proposes a number of tools to implement the objectives, including a legislative programme that will culminate in new pollution and waste legislation. A National Waste Management Strategy, which will form the basis for translating the goals and objectives of this policy into practice, has also been developed. The **National Environmental Management: Waste Management Bill** will give legal status to this White Paper.
White Paper on Development and Promotion of Tourism in South Africa	1996	The White Paper provides the government's stance on Tourism and describes the following: Role of tourism in South Africa Problems around tourism Way towards a new tourism Vision, objectives and principles How to ignite tourism growth Roles of the key player, Organizational structures. Based on an assessment of the problems, constraints and opportunities facing the South African tourism industry, the concept of "Responsible Tourism" emerged as the most appropriate concept for the development of tourism in South Africa.
White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity	1998	South Africa's initial response to addressing the United Nations Convention on Biological Diversity; it specifically recognizes the importance of estuaries and commits the government to a number of strategies to protect these areas. The strategies suggested cut across a number of legislative sectors such as water law, resource conservation and planning. These include: facilitating the development of appropriate legislation to secure the conservation of South Africa's wetlands, and to maintain their ecological and socio-economic function, promoting the establishment of a National System of Protected Wetlands, preventing inappropriate activities and development around wetlands, ensuring that adequate buffer strips are retained around wetlands, recognizing the functions and values of wetlands in resource planning, management and decision-making, determining the impact of commercial, recreational and subsistence fishery practices on fisheries, fish, and their habitats, and develop guidelines for managing such fisheries. **The National Environmental Management: Biodiversity Act (No. 10 of 2004)** gives legal status to this White Paper.

Table 5.3 continued

White Paper	Year	Short Description
Policy on Sustainable Forest Development in SA	1997	This paper provides synergy to the three strains of Indigenous Forest Management, Commercial Forestry and Community Forestry. Elements of the policy include: setting nine guiding principles, future goals and overall policy to govern the place of forestry in the management of land, water, and other natural resources This paper provides policy for: industrial forestry; community forestry; the conservation of our natural forests and woodland; South Africa's response to global concerns about forests; research, education and training; South Africa's relationships with states in the Southern African Development Community.

5.3 REGIONAL LEGISLATION (Table 5.4)

Table 5.4 Summary of regional (Western Cape) legislation relevant to estuarine management.

Provincial Legislation	Lead Agent	Short Description
Municipal Ordinance (Cape of Good Hope; No. 20 of 1974)	?	Grants local authorities in the province of the Western Cape the power 'to drain storm water into any natural water course'. To this end, a number of local authorities have passed by-laws.
Land Use Planning Ordinance (Ordinance 15 of 1985, as amended in 2004)	Provincial DEADP	Provides for the establishment, powers, functions and funding of Western Cape Nature Conservation Board. Planning applications are in terms of this Ordinance; also provides for appeals against municipal planning decisions.
Western Cape Housing Development Act (No. 6 of 1999)	?	Determines general principles applicable to housing and the role of government in housing development.
Western Cape Planning and Development Act (No. 7 of 1999)	Provincial DEADP	Lays down guidelines for future spatial development in the Province in order to promote the general welfare of communities.
Cape Nature Conservation Board Act (No. 15 of 1998)	Provincial DEADP	Allowed for the establishment of the Cape Nature Conservation Board. Defines the Board's objectives and responsibilities.
Cape Nature and Conservation Ordinance (No. 19 of 1974 as amended in 1999)	Cape Nature	Sections of the Ordinance refer to inland waters which include tidal rivers or estuaries.

In addition to the Regional legislation detailed in Table 5.4, the policies and procedures of Cape Nature pertaining to structures below the high water mark will also apply (Cape Nature 2007). The policy document stipulates the involvement of Cape Nature and the Department of Environmental Affairs and Development Planning (DEADP) in the regulating, operating and legalisation process of jetties, slipways and other structures (e.g. retaining walls, gabions etc.) below the high-water mark in terms of the Sea-Shore Act, 1935 (Act no. 21 of 1935) and the National Environmental Management Act, 1998 (Act no. 107 of 1998) and its regulations (that is, ORV and EIA regulations). It mainly concentrates on structures in the tidal waters of the Western Cape Province and provides guidelines that will be used during the above-mentioned process. It also provides a framework of specifications for jetties, slipways and moorings in estuaries in the Western Cape and riparian landowners should take note of these guidelines and can plan the structures accordingly. If the guidelines cannot be adhered to, good motivation must be provided that can be used to motivate the approval of the structure.

5.4 LOCAL (MUNICIPAL) LEGISLATION

The proposed Hessequa Municipality by-laws (yet to be promulgated) relating to the management and use of rivers are relevant to the Gouritz and the EMP. These by-laws detail the following aspects;

- Management of boats and use of rivers (includes specifications for required equipment as detailed in Schedule 1);
- Registration and licensing of boats;
- Fixing of tariffs and fees;
- Pollution of rivers;
- Powers of authorized officers;
- Houseboats;
- Specific provisions relating to certain rivers (details the requirement of the municipality to formulate management plans for rivers. These management plans must be subject to a public participation process and essentially comprise all the aspects that will be covered by the EMP); and
- General provisions.

6. EXISTING MANAGEMENT PLANS, DEVELOPMENT STRATEGIES, POLICIES AND CONSERVATION INITIATIVES.

6.1 HESSEQUA INTEGRATED DEVELOPMENT PLAN

In terms of the Municipal Systems Act (Act 32 of 2000), all municipalities have to undertake an Integrated Development Plan (IDP) process to produce five year IDPs with legal status that supercedes all other plans that guide development at Local Government level. Hessequa falls within the Eden District Municipality, whose Vision is as follows;

We the people of the Eden region acknowledge that we are the custodians of the natural attributes of the region and collectively pledge to achieve sustained prosperity, safety and equity for the whole region and all its citizens through the active promotion of clean industries and environmentally-friendly activities.

The Vision for the 2nd generation Hessequa IDP (2008/09 1st Review) is assumed to be the same as stated in the Langeberg 2002 IDP and states the following:

To deliver sustainable services and facilitate development to the total community of the Langeberg (Hessequa) within the context of sustainable environmental management.

The Hessequa IDP has six Strategic Objectives, each of which has some relevance to the envisaged EMP.

6.1.1 Strategic Objective 1 - Ensure good governance through institutional transformation, inter-governmental co-operation and public consultation to ensure accountability.

The strategy is to entrench public participation in the decision-making process of the municipality as well as providing the scope for meaningful involvement in the

implementation of projects. As a result of this approach, the following outcomes of the municipal imbizo (Ward 1 – Gouritsmond) process have particular relevance to the EMP;

- Extension and development of existing hiking trails.
- Access road to slipway needs to be upgraded.
- Upgrading of sanitation system.

In addition, Hessequa has put in place a multi-stakeholder consultative forum to deal with environmental issues known as the Hessequa Environmental Advice Committee (HEAC), whose vision is to make a significant advisory contribution to improving the quality of life of all Hessequa citizens, particularly disadvantaged groups through progress in reconciling economic development with the sustainable use, protection and improvement of the environment for present and future generations. In the light of the increasing importance of environmental issues to South African and global society, the HEAC stands behind the overarching principle of sustainable development. The work of HEAC is under pinned by principles, including biodiversity conservation, environmental governance and environmental justice.

6.1.2 Strategic Objective 2 - Ensure sound financial management, maximised resource mobilisation through effective and efficient utilisation of scarce resources.

Even though the municipality is regarded as a viable and self sustaining entity, some key issues that may impact on the implementation of certain aspects of the EMP include;

- Preparing and implementing an income and expenditure budget that maps the reality more accurately than it has in the past.
- Greater attention to detail in the budget and more accurate forecasts to curb instances of under spending and over spending on the budget.

6.1.3 Strategic Objective 3 - Develop economic, human and social capital of our people, with special reference to the vulnerable groups.

In response to a range of identified economic issues, two strategic initiatives that are applicable to the EMP have been highlighted, namely;

- Identification and implementation of keystone projects, some of which would be aimed at preserving the overall ecology and heritage of Hessequa; and
- Development of human resources, focussing on training and capacity building.

One of the key drivers of the Hessequa Municipality is the growth in coastal towns involving a capital investment of about R100 million (p.a.) and producing a visitor income of around R32M in the summer season. Tourism has shown substantial growth as the demand for prime coastal and inland resorts increases, as well as the opportunities created by eco-tourism, cultural tourism and adventure tourism. If these tourism-based activities are to make use of the Gouritz estuary and surrounds, the EMP will be required to address these issues.

6.1.4 Strategic Objective 4 - Sustain the Hessequa environment through resource conservation, good land use practices and people-centred planning.

The challenge of global warming in the overall strategy for a Green Hessequa appears to have some relevance to the EMP. Climate change impacts on agriculture, fishing and water (floods and drought). Hessequa Municipality has taken a positive stance to respond to environmental issues, conform to international protocols and position themselves as a leading agent for change in environmental integrity. The Green Hessequa strategy is based on the following three pillars:

- Branding Hessequa as a Green Municipality;
- Electricity supply and demand management; and
- Environmental integrity

The message in the Green branding will be that Hessequa is a place that is clean, unpolluted, safe and run according to internationally accepted principles. Attention is paid to renewable energies, environmental protection and retaining the ecological heritage of the region.

In order to preserve the environmental integrity of the region, a range of initiatives have been identified and include wetlands preservation, natural resource management, heritage conservation and environmental law enforcement. Estuaries *per se* are not mentioned and should be included as part of the wetlands initiative. The Hessequa State of the Environment Report (SOER) however does recognize estuaries as a major challenge together with climate change, energy, biodiversity, inland & coastal waters, agriculture & land, waste & sanitation, health & poverty, environmental education and cultural heritage resources. With regards estuaries alone, the following states have been highlighted that require attention;

- Unchecked runaway development;
- Altered freshwater runoff via catchment developments and abstraction; and
- Overfishing and poaching, particularly of threatened linefish species.

This objective also describes the need and strategy for an Integrated Environmental Management approach to existing and new activities and also for all land use zoning plans and schemes. Environmental Management Plans such as the Estuarine Management Plan is seen as one instrument of the IEM approach and can easily be linked with the IDP process at the strategic and operational levels.

6.1.5 Strategic Objective 5 - Strategic investment in high-quality basic services and efficient connectivity infrastructure.

The IDP acknowledges that without good infrastructure and services, the economic, social and environmental goals will not be achievable. State of infrastructure in Hessequa is fair to good but is under severe pressure and will collapse unless maintained and upgraded soon. Aspects that have relevance to the EMP include;

- Storm water – reticulation throughout the municipal area is insufficient; no plans exist for the upgrading of the system at Gouritsmond, but routine maintenance will be required.
- Water – infrastructure is sufficient for current requirements but resources are being used at full capacity and are at peak supply; need to develop new resources or extend existing licenses. Some suggested solutions (new sources) include rain water harvesting, new boreholes, desalination of seawater and treatment and recycling of water waste.

- Sewerage – Hessequa (and Gouritsmond) has a combination of septic tanks, conservancies and water borne systems; wastewater treatment capacity is sufficient for current and future demand;
- Solid waste – the IDP mentions five landfill sites in the region covering an area of 21.3 Ha but does not mention if this includes the site at Gouritsmond.

6.1.6 Strategic Objective 6 - Create an enabling social environment that ensures safe, healthy and vibrant communities.

The vision of this Objective is the social and economic development, upliftment and empowerment of youth, women, the disabled, children, the elderly and people living on the street and people with HIV & AIDS within the boundaries of the Greater Hessequa. The purpose of this is to ensure that the rights of the vulnerable people within our boundaries are protected and that their needs are met through service delivery thereby contributing towards poverty alleviation and development. One of the housing projects envisaged for the next five-year period is 60 IDP housing units (sustainable human settlements) at Gouritsmond; a growth such as this will impact on the estuary in a number of ways.

6.2 HESSEQUA SPATIAL DEVELOPMENT FRAMEWORK

The Spatial Development Framework (SDF) is prepared, approved and implemented within the legislative context of the Local Government : Municipal Systems Act, 2000 (Act 32 of 2000) and the subsequent Local Government : Municipal Planning and Performance Management Regulations (Section 4), 2001 promulgated under Section 120 of the Local Government : Municipal Systems Act.

The SDF is one of the operational strategies of the IDP, and is closely linked and should function with the other operational strategies. The SDF further gives effect to Council's vision for development and Council's objectives and strategies with respect to land development, use and management. The Vision for the SDF, based on the Vision for the Hessequa IDP is as follows:

The promotion of the standard of living and the experience and quality of life of the community and its environment in its entirety within the Hessequa region through the optimal utilization, conservation and sustainable maintenance of natural, cultural, human and all other existing resources in order to stimulate creative and sustainable solutions for all the challenges within the Hessequa region in conjunction with all stakeholders.

The following key objectives provide the framework for the SDF:

- To develop an effective management system for the protection of biodiversity and ecosystems through cooperation with all stakeholders.
- To develop and maintain a strong local economic base in rural areas through the promotion of tourism and the role of agriculture in the Municipal economy.
- To protect and conserve the region's heritage resources.
- To ensure an environmentally and economically sustainable infrastructure and service delivery system.
- To address the social requirements and expectations of the entire community.
- To promote the conservation and sustainable use of natural resources in the region.

- To ensure that development pressure and associated spatial implications are managed in a sustainable manner that will respect the unique character of the existing cultural landscape and the site-specific character of the existing spatial patterns.

One of the main principals that underly the Municipality's approach to the management of land-use and development is the maintenance of ecological integrity, i.e. the diversity, health and productivity of natural ecosystems should be maintained via a network of open spaces and the protection of important and sensitive habitats.

The chief components of the spatial concept include the natural environment (protected natural areas; threatened floral regions; rivers & wetlands, including the Gourits; and the Langeberg mountain range), agricultural and rural environment (comprising cultivated and grazing lands), town and urban environments (urban nodes and rural patterns; special development projects; towns with high growth potential; and preferred industrial areas) and infrastructure (comprising harbours and the N2 tourism route).

Six important ecological and evolutionary process areas are recognized within the Hessequa area and all are considered to be vital to the conservation of biodiversity within the region and the maintenance of ecosystem-services such as water quantity & quality, flood control and coastal processes. As a result, strict controls are placed on activities that are allowed; these include anything that does not interfere with the integrity of the process area. Two of these process areas, namely The Coastal Corridor (Area 4) and the Gouritsriviermond – Langeberg Area (Area 13) include the mouth region of the Gouritz and the river corridor from the coast to the interior mountains (Figure 6.1).

In terms of urban development strategies it is proposed that densities within existing nodes be increased to restrict the urban footprint and prevent uncontrolled sprawl. The current density at Gouritsmond is 5.9 units/ha and the proposed density is 7 units/ha; this must be achieved without impacting on water resources, areas of natural importance, ecological processes, biodiversity corridors, areas of visual significance etc. Any expansion must also take into account the capacity for service delivery and infrastructure.

The strategies for rural development make specific reference to rural residential estates (e.g. eco-estates or golf estates) that are designed to cater for the rich in an exclusive, high quality environment. Understandably the rural land surrounding the Gouritz estuary is highly desirable for such developments. However stringent restrictions have been placed on such undertakings, and for good reason, and these may only take place outside of existing urban boundaries under exceptional circumstances. The policy prescribes that the area has to have been designated a special rural development area in the SDF and the density may not exceed 1 unit/ha. Guidelines for development are as follows;

- Prevent fragmentation of natural systems and loss of biodiversity.
- Conform to the requirements of the NWA with respect to reserve estimations, water services development plans and surface water runoff management.
- Size of the development will be determined by environmental sensitivity, carrying capacity of the environment, service delivery and the principles of sense-of-place.
- The scale of the development must not be so great as to stimulate the development of secondary features such as shopping centres and petrol stations.
- The development must not promote urban sprawl or ribbon development.

Any proposed developments within the rural area must also take into account their impact on heritage resources and any impact assessment must address the sense-of-place issue via a visual impact study.

The agricultural development strategy highlights the need to protect areas that are considered to be primary (high) production areas and to maintain economically viable farms or units; this can be achieved by preventing changes in land-use from agriculture to any other land-use. The need to implement development projects for emerging farmers within newly development agricultural nodes is recognized. Sustainable use of agricultural lands and their resources needs to be encouraged and instilled in farmers.

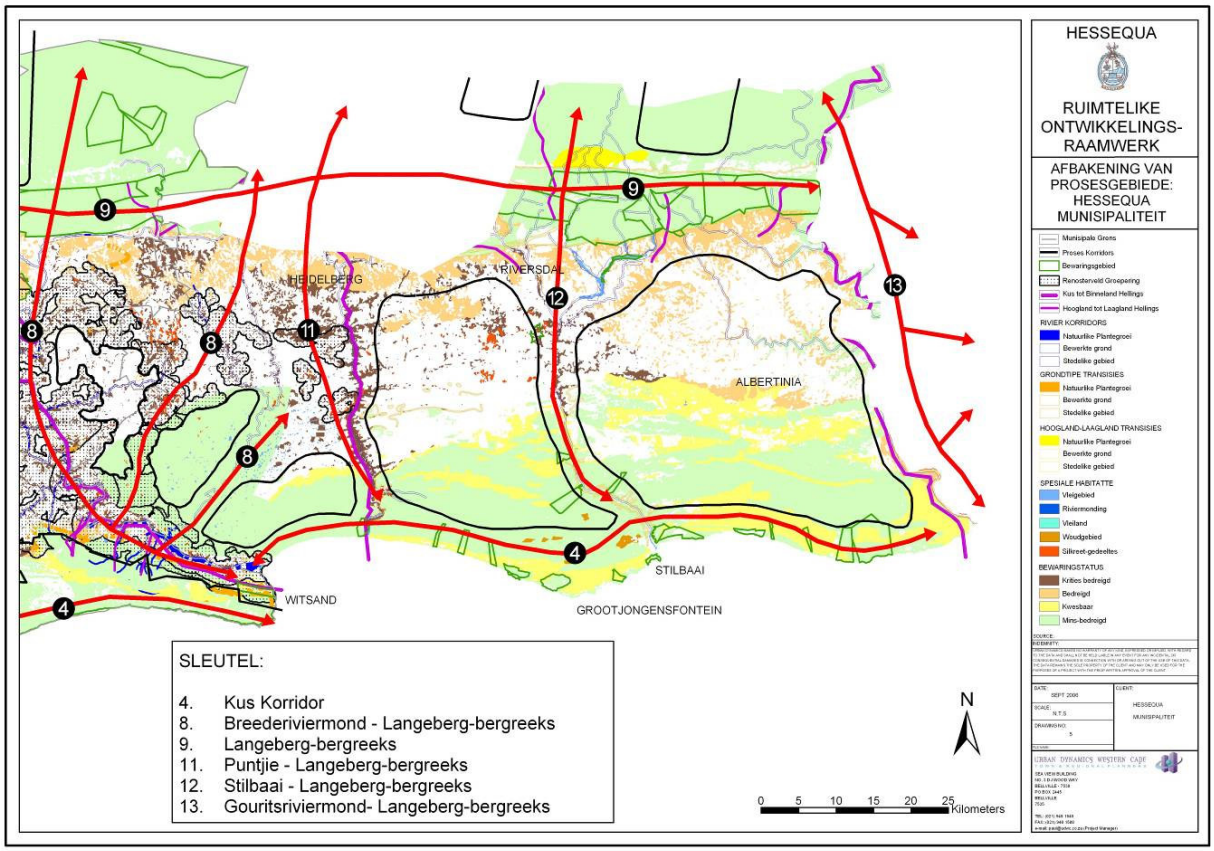

Figure 6.1 Demarcation of ecological process areas within the Hessequa Municpality.

The issue of Bulk Services has some relevance to the EMP, particularly with regards to upgrading and/or installation of water-born sewerage treatment facilities at coastal towns to reduce the threat of pollution, the determination of flood lines and application of building restrictions (new developments should only be approved according to floodlines) and the licensing of all solid-waste disposal sites.

6.2.1 Planning principles and strategies for Gouritsmond

Gouritsmond is seen as a holiday and retirement town and a service centre with limited resources that provides for local requirements. It is classed as a third order regional node with limited growth and development potential; these being restricted by the availability of water and bulk services and the environmental sensitivity of the area which does not lend itself to development.

Spatial development principles aim to promote sustainable utilization of the coastal zone and Gouritz estuary, restrict businesses to the demarcated business area, restrict expansion to within the designated urban edge and maintain the character and visual quality of the town, coastal area and estuary. The 10-year urban edge (Figure 6.2) has been determined by the limited potential for growth and development underpinned by the availability of bulk services, and has been informed by the Sub-regional Structure Plan for the coastal area between Macassar and the Gouritz River.

The following spatial development and land-use strategies (with relevance to the EMP) have been proposed to manage the spatial form of Gouritsmond for the next 10 years:

- Improve tourist facilities.
- Restrict development to within the urban edge to protect sensitive coastal (and estuarine?) region.
- The possible relocation of the caravan park to an area closer to the estuary.
- Upgrading and licensing of the slipway and associated parking area; utilization of and access to the estuary must be managed to ensure optimal sustainable use.
- Sensitive bio-physical areas must be managed in accordance with conservation goals and must be protected from urban developments; these areas include the Gouritz estuary.
- Protection of the Gouritz River ecological corridor and linear open space system in accordance with conservation goals.
- Upgrading of the mostly septic tank sewerage system will need to be considered in the future.
- The capacity of the existing solid-waste dump site must be investigated; an alternative is to utilize it as a way-station and waste can be transferred to a larger regional dump site.
- Water supply is currently satisfactory; future expansion should not be allowed if water resources cannot cope with the demand.

6.3 LOWER GOURITZ RIVER SPATIAL DEVELOPMENT PLAN

The SDP encompasses an area that extends from the coast to just past the N2 and includes a substantial portion of land on either side of the Gouritz River and estuary; as such it incorporates parts of both the Mossel Bay and Hessequa Municipalities. The SDP was prepared by Dennis Moss Partnership (Inc.) (DMP 2004) at the behest of the Hessequa Municipality and the Gouritz River Conservation Trust. Although an SDP does not confer or take away any use rights, the official approval of such a plan in accordance with the Western Cape Planning and Development Amendment Bill (December 2002), does grant substantial status to the plan. The SDP was drafted to inform the IDP but few of the recommendations appear to have been included in the 2nd generation IDP, or implemented.

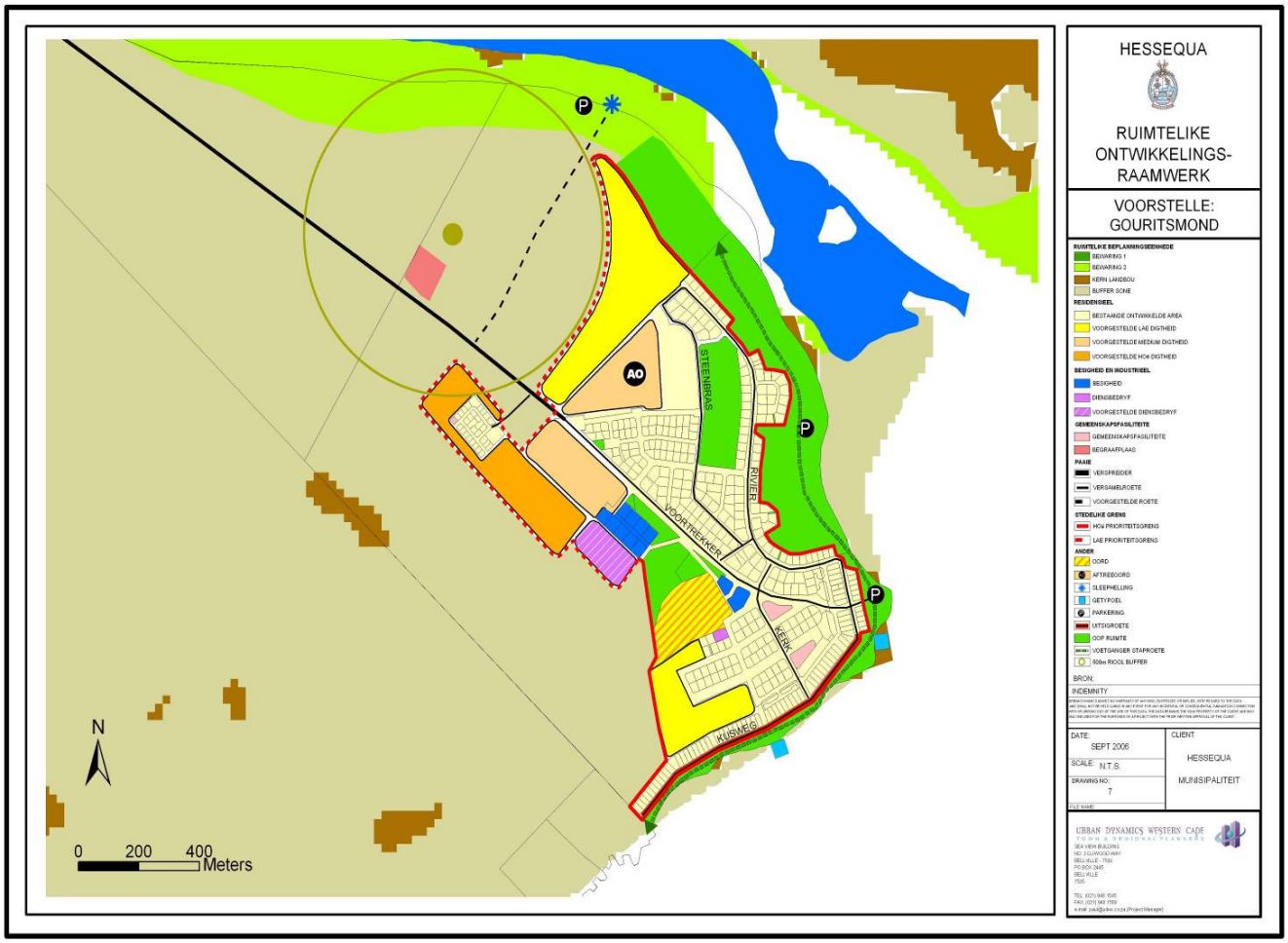

Figure 6.2 Desired 10-year Spatial Development Plan for Gouritsmond.

In accordance with the principles of bioregional planning and management, the SDP includes a number of suggested goals for the lower part of the river, the mouth and its surrounding environment, namely (DMP 2004):

- Provide sustainable educational and outdoor recreational opportunities on and around the river and ensure an equitable balance of opportunities and benefits in its utilisation.
- Seek greater co-operation between all spheres of government and work towards the integration of environmental planning and management in the Municipality as a whole.
- Promote a conservation ethos in the minds of the people of the area and the general public.
- Provide a 'laboratory' for sustainable biodiversity conservation.
- Illustrate the implementation of bioregional planning and management in the Municipality as a whole, and specifically in the Lower Gouritz River.
- Implement management practices that benefit current and future generations, and honour our obligations and undertakings at all levels of society.

- Strive for recognition by all the people of Gouritsmond that the Lower Gouritz River is 'their' property to enjoy in a spirit of community.
- Promote a shared responsibility with the people of Gouritsmond to maintain the health, diversity and productivity of the Lower Gouritz River in a spirit of stewardship and caring.
- Develop an integrated long-term environmental planning and management policy for all of the remaining natural areas and/or ecological corridors in the Municipality.
- Ensure that future growth and development proposals for Gouritsmond are compatible with the vision, goals and objectives of the Lower Gouritz River and its associated ecological corridors.

The SDP appears in much the same format as is envisaged for the EMP and many of the objectives, management strategies and strategic actions will be included in the EMP document. The SDP provides a Vision, Overarching Goal and Sustainable Development Objectives (including social, economic, biophysical and technical sustainability) for the Lower Gouritz River. Management proposals and strategies are provided for the environment, development, tourism & outdoor recreation (includes a zoning scheme for the estuary; Figure 6.3) and management (institutional and administration). Monitoring and research programmes are also highlighted.

6.4 CAPE ACTION FOR PEOPLE AND THE ENVIRONMENT

The *Cape Action for People and the Environment* (C.A.P.E.) is a project developed in partnership with the Global Environment Facility (GEF) to secure the future of the Cape Floral Kingdom. The C.A.P.E. project was made possible by a grant from the GEF and established to develop a long-term strategy to conserve biodiversity in the terrestrial, marine and freshwater ecosystems of the Cape Floral Kingdom (Table 6.1).

Table 6.1 Themes and Strategic Components of C.A.P.E. (after DMP 2004).

THEMES	STRATEGIC COMPONENTS
Conserving biodiversity in priority areas	a) Strengthening on- and off-reserve conservation b) Supporting bioregional planning
Using resources sustainably	a) Conserving biodiversity and natural resources in catchments b) Improving the sustainability of harvesting c) Promoting sustainable nature-based tourism
Strengthening institutions and governance	a) Strengthening institutions b) Enhancing co-operative governance c) Promoting community involvement

C.A.P.E. has produced a Strategy and Action Plan, specific objectives of which include the following (after DMP 2004):

- Establishing an effective reserve network, enhancing off-reserve conservation, and supporting bioregional planning.
- Developing methods to ensure sustainable yields, promoting compliance with laws, integrating biodiversity concerns into catchment management, and promoting nature-based tourism.
- Strengthening institutions, policies and laws, enhancing co-operative governance and community participation, and supporting continued research.

6.5 SUBTROPICAL THICKET ECOSYSTEM PLAN

(Description taken from DMP 2004)

The Subtropical Thicket Ecosystem Plan (STEP) is a three-year project co-funded by the GEF to identify priority areas for conservation actions in the thicket biome and to ensure that national, provincial and local authorities implement the conservation plan.

The STEP project focuses on the core area of the Thicket Biome, which occurs between the Groot-Gouritz river system in the west, the Kei River in the east, and the Great Escarpment in the hinterland in the vicinity of Graaff-Reinet in the west to Queenstown in the Eastern Cape.

The region includes the Albany Centre of plant endemism and overlaps in the west with the Succulent Karoo Centre. Both are centres of diversity and endemism for succulents and bulbs and are floristically the most important parts of the Thicket Biome. The Albany Centre is a recognised WWF-IUCN global centre of plant biodiversity, and nearly all of its plant endemics are components of the Thicket Biome. The Thicket Biome in this region is thought to contain the most species-rich formations of woody plants in South Africa. It overlaps with the Cape Floristic Region, which is the subject of a major strategic conservation planning exercise.

The overall aim of STEP is to:

- Provide a detailed spatial analysis of the various thicket types.
- Assess the extent of their transformation and develop a better understanding of the threats.
- Locate and design conservation areas to achieve explicit representation goals.
- Suggest and prioritise explicit conservation actions.
- Provide information for incorporation into regional Structure Plans and national Environmental Management Frameworks.
- Provide a capacity building service in GIS-based conservation planning.
- Guide investors from the public and private sectors in the selection of land for commercial enterprises, e.g. game-based ventures.
- Create an awareness of the value and plight of the Thicket Biome.

6.6 SUCCULENT KAROO ECOSYSTEM PROGRAM

The SKEP is funded by the Critical Ecosystems Partnership Fund (CEPF) and its aim is to gather data and generate consensus amongst all stakeholders for a holistic conservation and sustainable land-use plan for the Succulent Karoo Biome (DWAF 2007). This project boasts a large stakeholder base representing government (Cape Nature), academia, NGOs, private sector and local communities.

6.7 GOURITZ INITIATIVE

The Gouritz Initiative (GI) is a campaign developed in partnership with the C.A.P.E. and the Western Cape Nature Conservation Board (WCNCB) to promote biodiversity conservation and sustainable development in the region. It is a venture also funded by the CEPF. The GI's primary aim is to promote responsible and sustainable use of the natural environment, and will strive to foster cooperation and good working relationship between all stakeholders to

ensure a more focused allocation of resources and greater equity, efficiency and productivity in the region (DWAF 2007). In accordance with this aim the GI involves Government Departments such as DWAF, Agriculture, DEADP, Cape Nature and Municipalities; NGOs such as WESSA and the Gouritz River Conservation Trust; developers; private landowners; civil society; and projects such as STEP and SKEP.

The GI aims to form a partnership with the municipalities and participate in land-use and natural resource management. The GI, furthermore, wants to align with, and be included in municipal IDPs and SDFs and become involved with rural development in a conservation economy. The GI recognizes that only through alignment with these planning frameworks, can several of its projects and strategies be effectively implemented.

The extent of the GI is essentially demarcated by the north-south corridor of the Gouritz River which extends from the coast through the Little Karoo and into the Great Karoo, and the two west-east corridors of the Swartberg and associated mountains in the north (boundary between Great and Little Karoo) and the Langeberg/Outeniqua mountains in the south (boundary between coastal area and Little Karoo) (Figure 6.4). These corridors provide opportunities to protect ecological processes and patterns such as migration routes and can also be used in fire management (DWAF 2007). Immediate threats to the region, which will be addressed by this initiative, include alien invasives (plants and freshwater fish), destruction of natural habitats, water abstraction and private developments.

6.8 GOURITZ ESTUARY

There is currently no specific management plan for the Gouritz estuary. However, management related issues are referred to and dealt with by the Gouritz River Conservation Trust which comprises members from civil society, agriculture and the municipality. The Trust appears to be very active in all aspects pertaining to the estuary and have been responsible for several successful projects to date. They have successfully opposed several proposed developments adjacent to the estuary and function effectively as environmental watchdogs ensuring that all users are aware of their responsibilities with regards the estuary and its resources in relation to relevant legislation. This Trust will in all likelihood form the basis of the envisaged Estuarine Management Forum.

6.9 GOURITSMOND COMMONAGE VELD AND WILDLIFE MANAGEMENT GUIDELINES

The Gouritsmond Commonage comprises several portions of land zoned as public open space which for the most part forms a continuous undeveloped buffer zone around the town and which is considered to be a community reserve. Large portions of this commonage located to the north and north-east of the town are adjacent to the estuary. As such their management has direct implications for the EMP. Conservation Management Services (CMS) has formulated a detailed series of management guidelines for the commonage, some of which may be included in specific management action plans for the estuary; these include soil erosion control, alien vegetation control, access road and hiking trail management and rehabilitation.

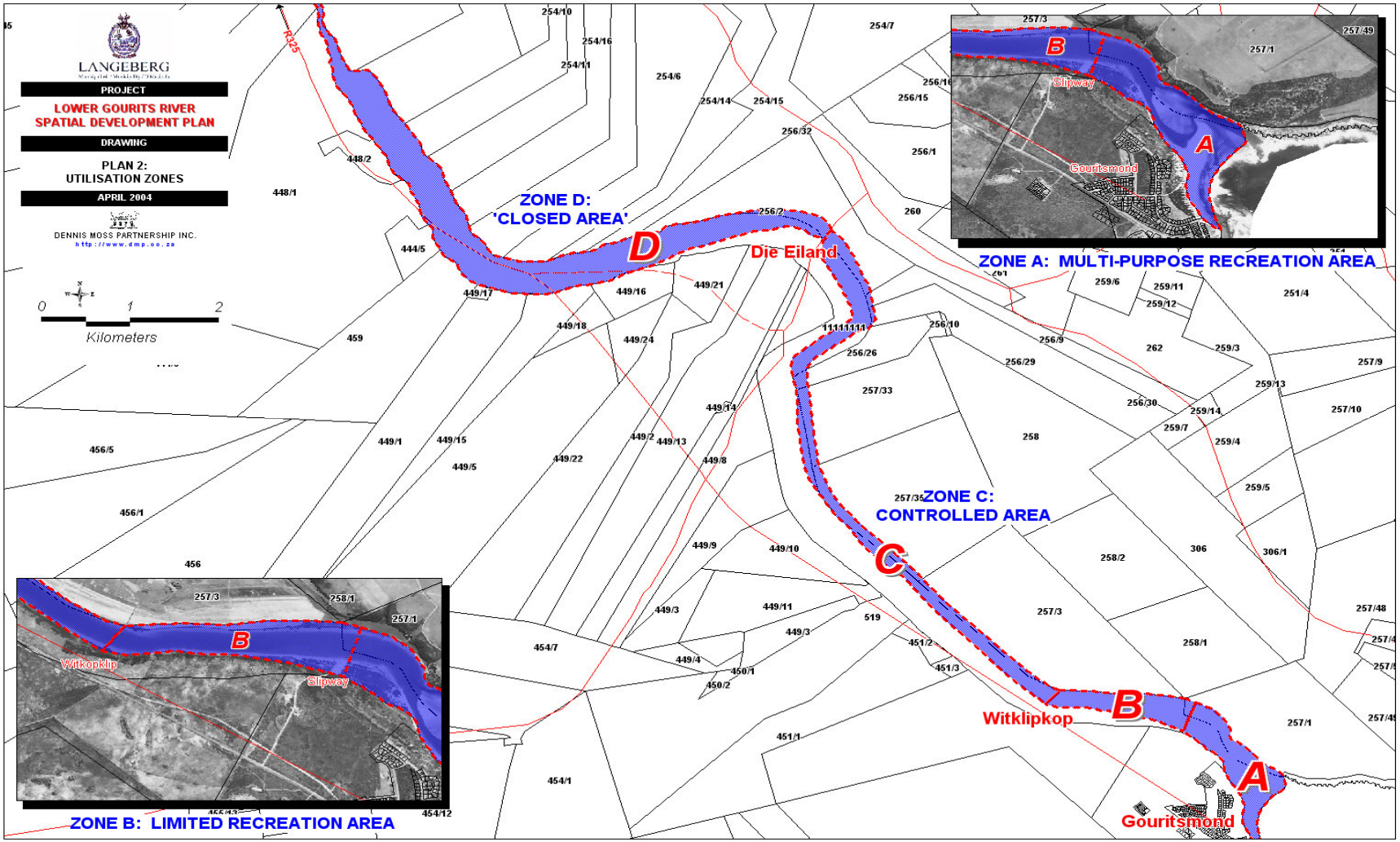

Figure 6.3 Recreational use zonation plan for the Lower Gouritz River (after DMP 2004).

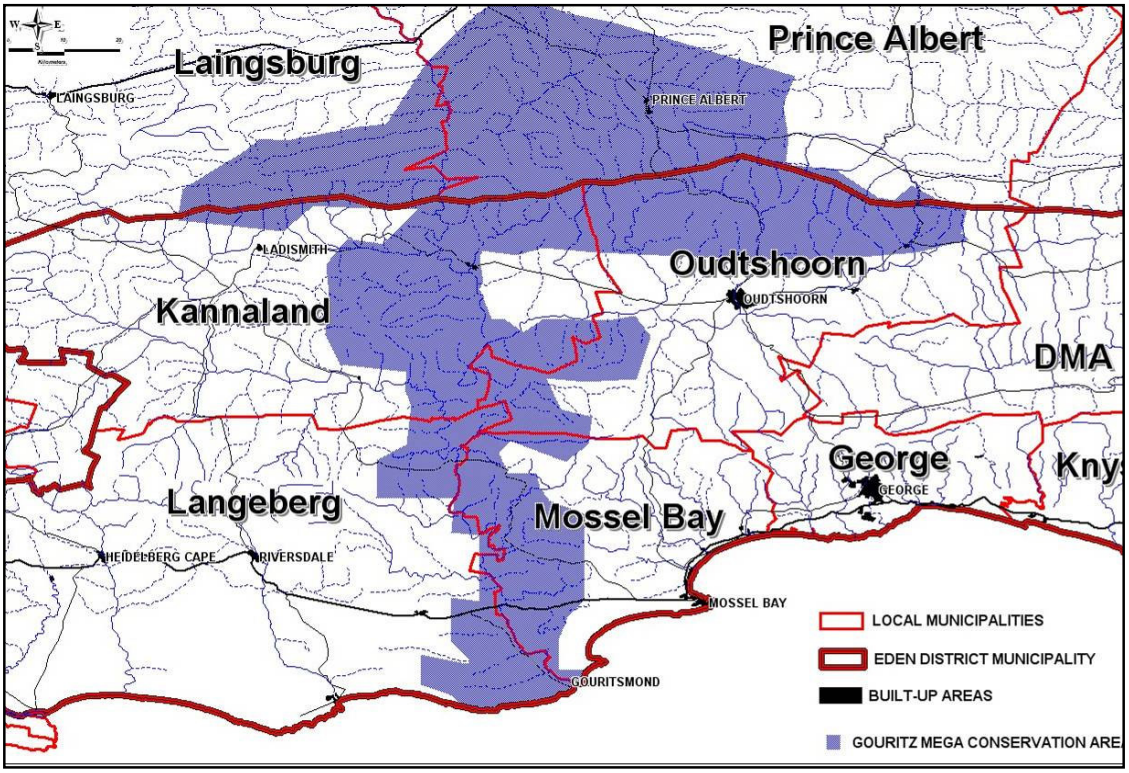

Figure 6.4 Proposed Gouritz Mega Conservation Area as depicted in the Eden District IDP of 2003 (after DMP 2004).

Numerous footpaths lead through the commonage down to the estuary and apart from the threat to sensitive vegetation they are a source for erosion that leads to sediment being washed into the estuary. Steps have been taken to close off and rehabilitate these paths and provide alternative stabilized paths and a network of hiking trails through the commonage and saltmarsh areas (see also Figure 7.2). Hiking trails need to be managed to prevent erosion on the steep slopes leading to and from the estuary. Similarly, there are cases where vehicles have made illegal roadways and this is of particular concern for erosion and where tracks pass through sensitive saltmarsh areas. Steps are recommended for roadway closure and rehabilitation, particularly where there is evidence of severe erosion.

The infestation of alien plants is also a problem within the Gouritsmond Commonage, with the manatoka and rooikrans being most widespread. Eradication and regrowth control measures have been proposed to manage this problem to prevent the loss of indigenous species and entire sensitive habitats.

6.10 LOCAL POLICIES AND STRATEGIES

6.10.1 Integrated Hessequa Environmental Policy (IHEP)

The Municipality of Hessequa faces a challenge of promoting development whilst managing the redistribution of resources to redress current inequities. Whilst striving to achieve this goal it is imperative that the environment is effectively managed through the application of the fundamental principles of sustainable development. In order to ensure that this is achieved

the IHEP has been formulated to provide a series of strategies and programmes. The IHEP is a statement of intent, a commitment to certain principles and ethics and the development of sectoral strategies which will detail goals, targets, programmes and actions needed to ensure sustainable resource use and management of this unique environment for the benefit of all.

In response to this, several strategies have been drafted and will be developed within five years of the IHEP being adopted as an official policy. A few of these strategies that may be used to inform the EMP are detailed below.

6.10.2 Hessequa river and estuarine strategy

This strategy does not address all riverine and estuarine management issues as it deals with both aspects at a municipal and not site-specific level. Instead it provides a basis for the development of detailed management plans for specific systems. The overall objectives of this strategy are to;

- Promote sustainable management of systems through cooperative management.
- Set targets for desired future use/state.
- Set management guidelines and approve essential by-laws.
- Develop detailed river and estuary registers and management recommendations for priority systems.

The strategy goes on to identify existing pressures or challenges under the themes of governance & capacity building; our National asset (public access, awareness and facilities); coastal & river planning and development; natural resource management; and pollution control and waste management. Responsible authorities are the municipality (local law enforcement), DEA&T (environmental and biodiversity management) and DWAF (implementation of NWA). General recommendations include participative management, formulation of environmental management plans for priority systems and the establishment of monitoring programmes and an estuarine data base.

6.10.3 Hessequa Biodiversity strategy

This document provides an overarching framework for a regional consolidated and coordinated approach to protecting and enhancing the rich biodiversity in Hessequa. A key aspect of this strategy is the consolidation and integration of separately developed initiatives to ensure that all are aligned within a common framework. These include the C.A.P.E. programme and Gouritz Initiative. The strategy has the following Vision:

To be a region that leads by example in the protection and enhancement of biodiversity. A region within which biodiversity plays an important role, where the right of future generations to healthy, complete and vibrant biodiversity is entrenched, and to be a region that actively protects its biological wealth and prioritizes long-term responsibility over short-term gains.

There are seven Strategic Objectives, namely;

- Primary biodiversity conservation - establishment and effective management of a network of biodiversity areas and nodes in order to protect indigenous fauna and flora.
- Secondary biodiversity conservation – the maintenance of open space or corridors that can act as a link and facilitate the movement and migration of species.

- Biodiversity in freshwater aquatic ecosystems – the effective management of freshwater systems (rivers, wetlands, dams and estuaries) in order to maintain and enhance biodiversity whilst ensuring effective functioning for storm water management and other functions such as flood control, water purification and regeneration of soil fertility.
- Management of alien invasives – eradication of all alien species as they compete with indigenous species for habitat, increase the intensity of fires and affect water quantity & quality.
- Biodiversity legislation and enforcement – existing and new legislation dealing with the management and utilization of species, habitats and ecologically sensitive areas must be enforced.
- Information and monitoring system – establish a central data base where high quality information on biodiversity is stored, interpreted and made available to policy- and decision makers; data base can provide base-line data for monitoring programmes.
- Biodiversity education and awareness – establish a Knowledge Management Programme that will empower all stakeholders with regards biodiversity issues so that all can share and take collective responsibility for Hessequa's biodiversity resources.

6.10.4 Hessequa coastal zone strategy

This strategy deals largely with marine-related aspects but includes estuarine management as one of its Strategic Objectives. This is justified as follows:

"The unique environment created within estuaries, the role they play in the broader coastal ecology, the fact that they are often recipients of effluent created higher up in the catchment, and their role as recreation nodes has resulted in estuaries having been singled out…"

The goal is develop EMPs for all estuaries within Hessequa in order to optimize their value as recreational nodes and to ensure their health, their role in biodiversity conservation.

6.10.5 Hessequa environmental education and training strategy

The motivation behind this strategy centers around the need for awareness regarding policy and legal requirements, an understanding of the various IHEP strategies, the role that education and training play in core local government functions and the need to share management responsibilities between local government and environmentally educated members of the public. Environmental education and training can contribute to poverty reduction, economic development and job creation through its role in ensuring that the natural and cultural resources on which jobs, livelihoods and economic development depend are managed sustainably. The strategy outlines several strategic objectives that should help achieve a level of environmental awareness and consciousness amongst the people and ensure that education staff are competent with regards environmental issues. Implementation of the strategy would require the establishment of an environmental education task team.

The principles surrounding environmental education and training should ensure the following:

- All age-groups, communities and government organizations should be considered.
- Learning must have relevance to all different life-styles.
- The environment and heritage resources must be linked to health, socio-economic development, social justice and quality of life.
- Outcomes must include environmental awareness and a commitment and capacity to act on environmental matters.
- Provide information and instill the ability to find, analyse and use information.

- Recognition of the complexity of environmental issues and the need to develop solutions collectively.
- Development of sound environmental practices.
- People should be empowered to participate in order to create a better environment for all.
- Existing skills are recognized and enhanced.
- Practical skills are developed and understood.
- Recognition that there is a value component to skills development.

7. GOODS & SERVICES PROVIDED BY THE GOURITZ ESTUARY

The following section provides a brief description of the existing goods and services provided by the estuary and any proposed changes or additions as alluded to by stakeholders (see Appendix 1; Figures 7.1 and 7.2).

The majority of land within the greater catchment and along the Gouritz floodplain adjacent to the estuary is zoned as agricultural and a variety of high-intensity, irrigation dependant farming activities take place, including lucerne, pasture and grains for cattle feed, fruit, vineyards and vegetables and livestock (sheep, goats, ostriches and dairy cattle). Several conservation areas also exist, including the buffer zone of open space surrounding Gouritsmond which abuts onto the estuary to the north and north-east. Aerial photographs clearly show the extent to which the land adjacent to the estuary has been altered to accommodate these activities (Figures 7.1 & 7.2). There appear to be no restrictions governing how close to the river or estuary farming activities may take place, and in most cases cultivated lands or grazing of livestock takes place up to the waters edge (Plate 7.1).

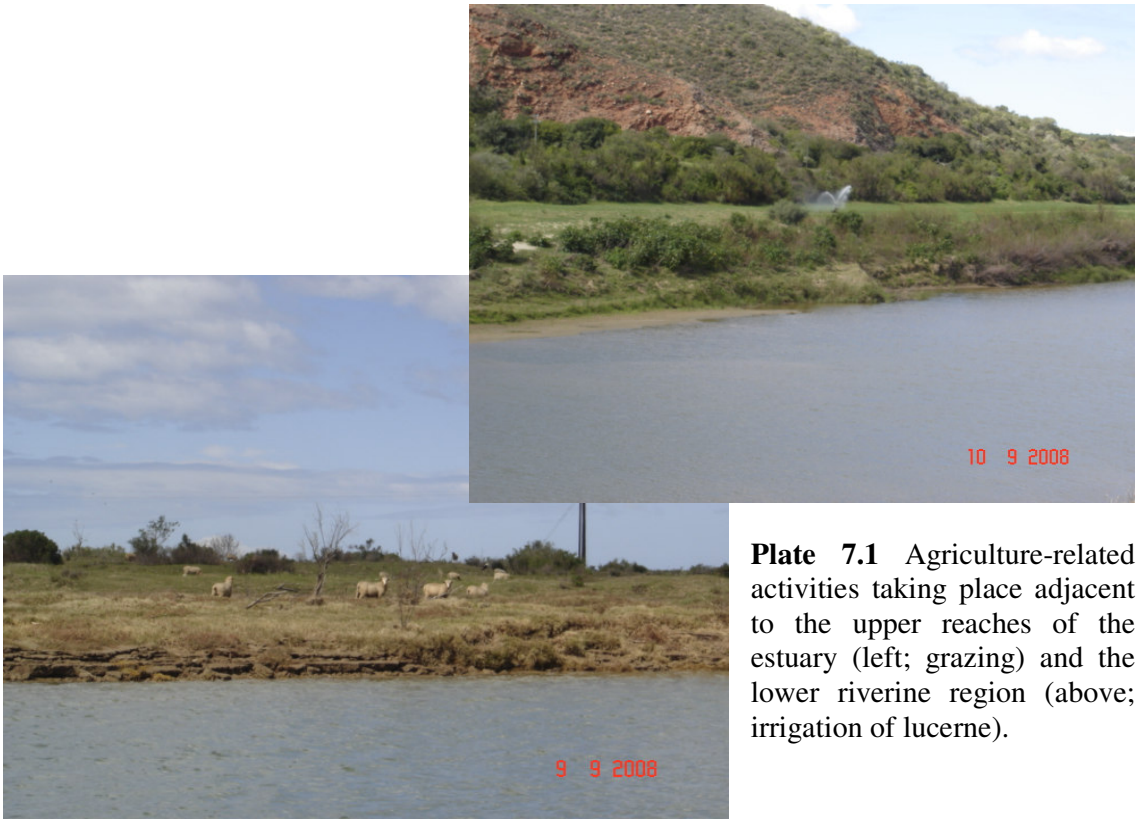

Plate 7.1 Agriculture-related activities taking place adjacent to the upper reaches of the estuary (left; grazing) and the lower riverine region (above; irrigation of lucerne).

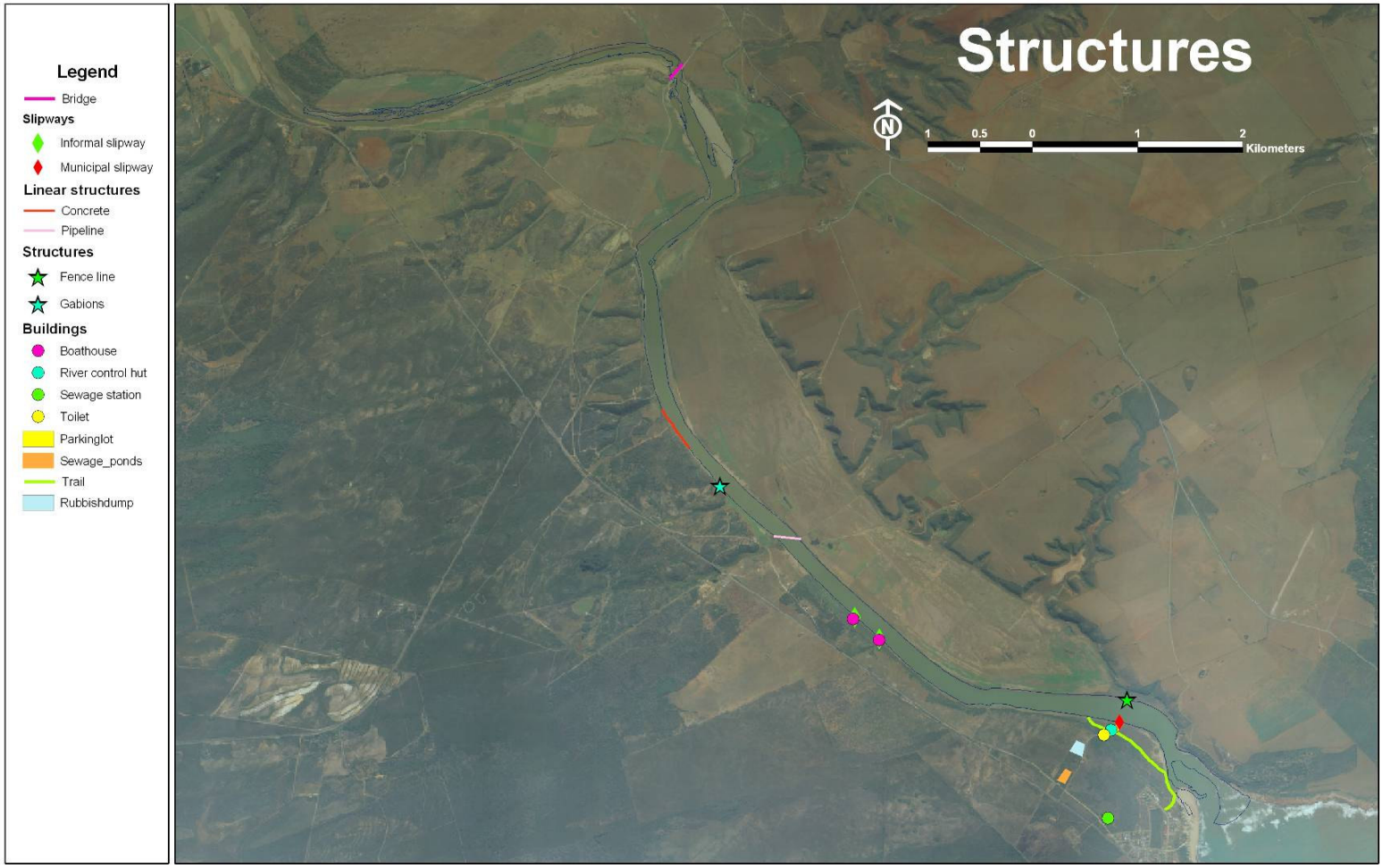

Figure 7.1 Aerial view of the Gouritz estuary showing the location of existing structures and the hiking trail. The transformed land adjacent to the estuary, particularly on the eastern side can be clearly seen.

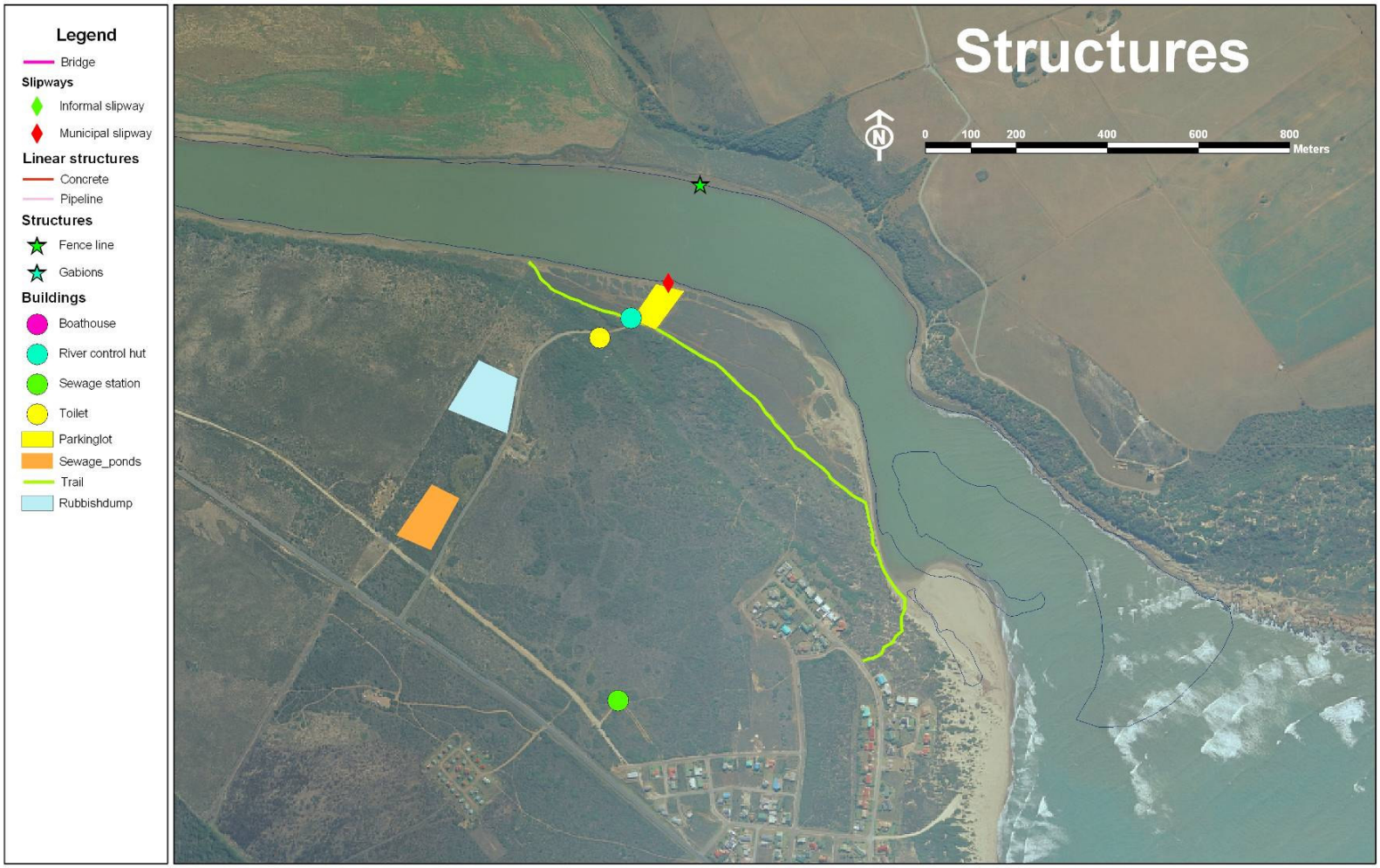

Figure 7.2 Close-up view of the lower reaches of the Gouritz estuary showing existing structures, the hiking trail and the town of Gouritsmond.

The town of Gouritsmond, located immediately to the west of the estuary mouth, is classified as a third order Regional node in the Hessequa SDF and ranks only 97th out of 131 Western Cape towns in terms of growth potential. The town's main economic base is centered around tourism and part-time residents owning a second house or property. At present, the majority of the 350 erven are developed and a caravan park provides additional camping sites. Municipal services include water and sewerage; although most of the erven have septic tanks, all new structures will either be linked to a water-born system or conservancy tanks. Stormwater appears to be managed effectively although there is a small amount of runoff into the estuary from pathways and the road leading past the waste site to the slipway.

There are currently no large-scale developments on the eastern side of the estuary and the resorts of Kanon, Fransmanshoek and Vleesbaii are located outside of the area of concern. The residents of these resorts, however may make use of the good provided by the estuary in the form of fishing or recreational boating. Although several large-scale residential developments adjacent to the estuary have been planned, these have been successfully opposed by the Gouritz River Conservation Trust and the Municipality; it is likely though that further attempts will be made in the future.

There is a single functioning slipway on the western side of the estuary just outside the urban edge of Gouritsmond (Plate 7.2). It comprises a large parking area, a shelter for the river control officer, three braai areas, several waste containers, information boards and ablution facilities. The original slipway has been cordoned off and should be rehabilitated. An additional *ad hoc* type slipway and two small boat houses are located in the middle reaches of the system (Plate 7.2). These are on private land and their use has resulted in severe erosion of the bank; these areas should be considered priorities for rehabilitation. The single public access point provides a unique opportunity for monitoring and control of recreational activities. Daily and annual tariffs for boats, vehicles and canoes (includes windsurfers, kite boarding etc.) are payable to the control officer and all proceeds go to the Trust. Recreational activities include swimming, windsurfing, kite boarding, canoeing, boating, water skiing, hiking (along demarcated pathways), bird watching, dog walking and fishing/bait collecting. Several commercially-licensed deep-sea boats and many recreational ski-boaters use the slipway and the estuary as a launch site. There are no fish cleaning facilities at the slipway and fishers clean their catch in the estuary and discard the waste into the system.

There are no jetties on the estuary, but one is being considered for the area adjacent to the slipway to reduce the amount of trampling and disturbance from boats forced to beach on the mudbanks.

A single bridge crosses the estuary just before the road meets with the R325 and just above the area known as Die Eiland. The bridge has replaced the original structure which was devastated during the 1981 floods (Plate 7.3). The location of the structure and the degree to which the banks and flow of the estuary have been altered is cause for concern. It is unlikely that this structure will survive another large flood as the pillar supports will serve to trap debris and increase the stress pressure from dammed up flood-water. Remnants of the old bridge are still present in the estuary and should be removed to improve flow along this section. The bridge spanning the river along the N2 does not interfere with the river or flow in any way.

Many sections of the estuary bank on both sides of the channel are severely eroded due to a combination of destabilization due to overgrazing; livestock accessing the estuary to drink; cultivating land too close to the edge; farm vehicles driving too close to the edge; fishermen

walking along the edge and down onto mudbanks to access bait; wave damage from wind driven waves; flood damage; and to a lesser extent boat wakes. Attempts to stabilize this damage have been undertaken at several sites and gabions have been used to try and rectify the problem. This has not been particularly successful, and downstream erosion further into the bank and behind the gabions has resulted (Plate 7.4). Rehabilitation of the banks using structures such as these is not seen as a high priority issue, but if attempted should be done under the authority and guidance of DEADP, Cape Nature and an estuarine or hydrodynamics specialist.

Plate 7.2 The existing slipway and car park (top left); the old slipway (top right); the two boathouses and slipway located on the west bank in the middle reaches with bank erosion (bottom left and right).

Above the estuary, the river itself is used extensively by farmers as a source of freshwater. At least eight pumps are located between the road bridge and the kranze (Plate 7.5) and this is only the extreme lower portion of the river. Water is pumped almost on a continual basis when levels are high enough. It is not known whether or not this is sustainable, or in some cases, even legal. Several supply pipelines run along the bottom of the estuary from the west

to the east in order to supply farms with no access to groundwater (Plate 7.5) and some have large structures protruding into the estuary for protection. One pipeline in the upper reaches runs alongside the western bank and is protected along its entire course by a concrete structure (Plate 7.5).

Plate 7.3 The existing low bridge over the Gouritz estuary with stabilizing materials that alter the flow dynamics (left) and the remnants of the original bridge washed away by the 1981 flood waters (right).

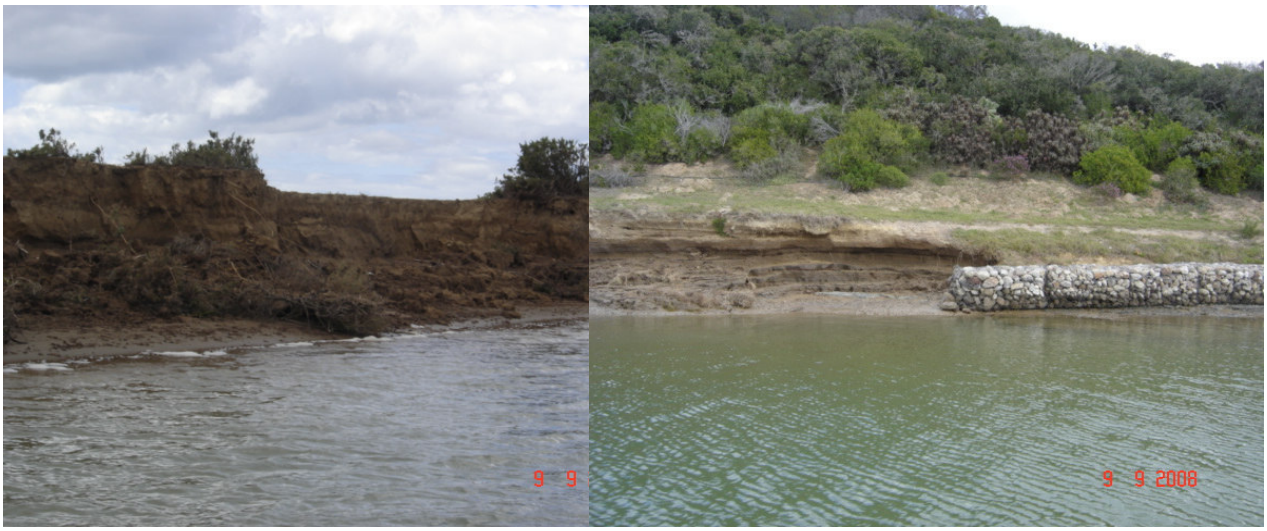

Plate 7.4 Erosion of a section of the eastern bank in the middle reaches (left) and stabilization attempts using gabions with the resultant downstream erosion (right).

Plate 7.5 Two pumps located in the lower region of the river (top left); water pipelines that span the width of the estuary in the middle reaches (top right); and a protected pipeline running alongside the middle reaches of the estuary (bottom).

8. EXPLOITATION OF LIVING RESOURCES

8.1 INTRODUCTION

An extensive desktop study was conducted to find all existing literature on the living resources and their exploitation in the Gouritz Estuary. A group of key stakeholders was identified and interviews were conducted telephonically or by email to obtain additional information (Appendix 1). A snapshot field survey was conducted from the 8th - 11^{h} September 2008 to ground-truth the existing information in the literature and that obtained from key stakeholders. During this field survey the following activities were conducted:

- Meetings were held with the Gouritz River Conservation Trust and with individuals from the Trust (Chairman: Daan Swart; Vice Chairman: Pieter Franzen) to discuss the EMP process in general, to highlight the importance of community involvement and to obtain all reports on the estuary in their possession.
- Org Niewoud (owner of a self catering accommodation and a fisherman) was interviewed to discuss the state of the fishery, bait collecting, possible future management strategies and the occupancy rate of his resort.
- Malan Share (resident and fisherman) was interviewed to discuss the state of the fishery and bait collecting as well as possible future management strategies.
- A field excursion to the upper reaches of the estuary was conducted with Pieter Cronje (resident and farmer) to discuss issues pertaining to freshwater use in the area.
- A boat excursion and interview was conducted with Frank Myburgh (River Control Officer) to observe and discuss all forms of resource use and enforcement on the estuary.
- Information on the number of day, month and year permits for boats and shore fishermen was obtained from the municipality.
- Information on the number of guests visiting/staying at tourist accommodation and the caravan park was gathered with the help of Miss Jolee.

8.2 CURRENT LEGISLATION PERTAINING TO LIVING RESOURCES

National legislation prohibits scuba diving, spearfishing, fishing without a permit and the use of fish nets other than a landing net or casting net in all estuaries. In addition, no fish captured in an estuary may be sold. A Hessequa municipal by-law (yet to be promulgated) prohibits people from holding or arranging any fishing competition without permission from the Municipality and the Gouritz River Conservation Trust. Fishing from any bridge or within 20 metres either side of a slipway is also prohibited.

Besides the municipal by-law which prohibits jetskiing, there are no restrictions on the type of vessel, size of engine or powerboating activities on the Gouritz Estuary. As such the estuary displays a multi-recreational user pattern, with many users not partaking in the exploitation of living resources.

8.3 FISHERY

Historically, the Gouritz estuary has been considered to be an excellent fishing destination, and was particularly known for periodic runs of large dusky kob during September, October and November (DMP 2004). Fishing is distinctly seasonal, with very little fishing effort occurring between June and August. Anglers interviewed during the snapshot survey suggested that angling has been poor during the last 10 years.

Grunter fishing in the estuary occurs throughout the year, with recreational and subsistence fishers targeted these fish using mud prawn, sand prawn and sand mussel. Unlike the grunter, large dusky kob are targeted during spring and summer using a variety of baits such as live mullet, sardine, squid, octopus leg and artificial lures (rapalas).

The majority of recreational anglers come from Gouritsmond and the nearby urban centres of George, Albertinia and Mossel Bay. During December and April, a large proportion of the recreational fishers come from further away, including Cape Town, Bloemfontein, Johannesburg and Pretoria. The subsistence users hail from the immediate vicinity of Gouritsmond/Bitouville and the surrounding farms.

8.3.1 Fishing effort

Despite its peri-urban location, there appears to be a significant amount of boat-based and shore fishing effort on the Gouritz Estuary. While jetskiing is not allowed, water-skiing and leisure power boating are allowed on the Gouritz Estuary. This suggests that not all boating activities on the system are aimed at exploiting its living resources. The Municipal River Control Officer estimates that approximately 80% of people launching boats from the slipway utilize the estuary's living resources. Since there is only a single access point, the public slipway, the boat license permits issued by the municipality provide a good indication of the level of living resource utilization on the estuary. Licenses can be purchased at the slipway, from the municipality or from and general dealer in Gouritsmond; these licenses can be in the form of daily, monthly or annual boat registration permits. Records of these purchases for river boats between 2000 and 2008 suggest that there is increasing pressure on the estuary (Figure 8.1). The number of boat trips on the river per year ranged from approximately 1200 in 2000/2001 up to 6600 in the 2006/2007 season. The Municipal River Control Officer indicated that very little boating activity occurs during winter, suggesting that most of the boating activity occurs during spring, summer and autumn. During these times, the majority of activity occurs during the major holiday periods in December and April.

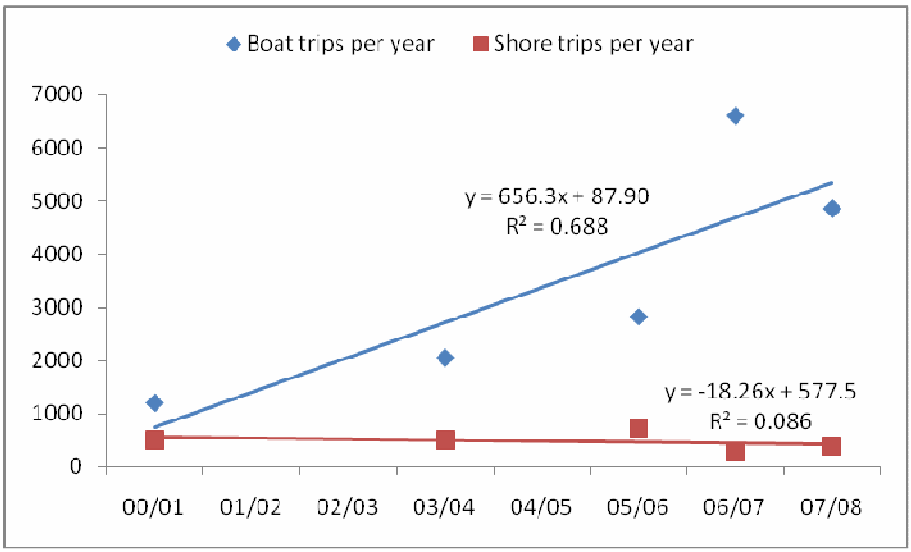

Figure 8.1 Number of permits for boat and shore trips in the Gouritz Estuary between 2000 and 2008.

Shore angling effort in the Gouritz estuary is not as high as boat-based angling effort. The lack of access to the estuary shoreline, particularly in the middle and upper reaches is a major contributing factor. The slipway parking lot is the major access point for shore anglers on the western shore. Shore anglers are required to pay the municipality a fee for parking their vehicles in the slipway parking lot. Between 2000 and 2008, the number of vehicles parked in the slipway parking lot has remained relatively stable, ranging from 273 to 738 vehicles per year. Although this value does not include fishers who travel by foot, it gives an indication of the trends in the shore fishery.

8.3.2 Distribution of effort

Information collected from recreational boat and shore fishers during the recent snapshot survey suggested that all boat fishing takes place between the mouth and approximately 8 km

upriver at "Bar se Gat". Within this area, there are four high effort zones including the areas around what is known as "Steentjie se Gat", "Witkopklip" and "Bar se Gat" (Figure 8.2).

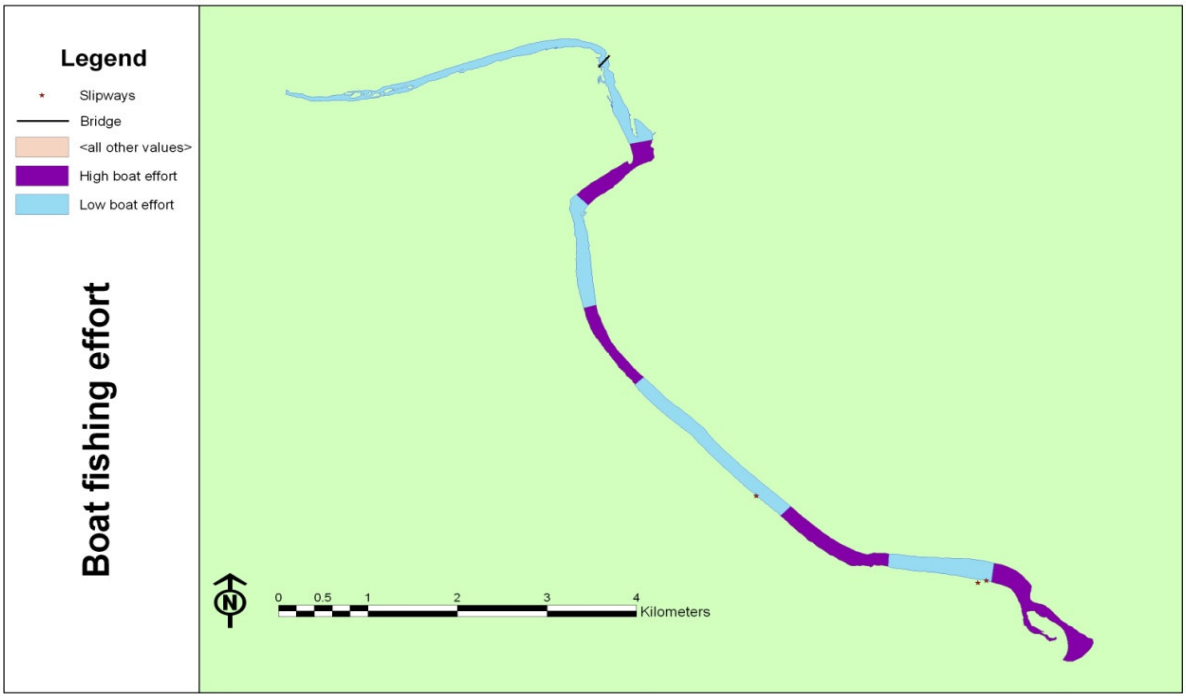

Figure 8.2 Boat-based fishing effort on the Gouritz estuary.

Recreational shore fishing effort occurs mostly at sites where fishers can readily access the shore (Figure 8.3). Due to the limited access on the eastern shore, which is mostly privately owned farmland, shore fishing areas for the public are almost exclusively on the western shoreline. Most shore fishing occurs from the slipway area up to Witkopklip (approximately 3.0 km upriver from the Gouritz Mouth), at "Bar se Gat" (approximately 8.0 km from the mouth) and around the road bridge at "Die Eiland".

Although subsistence fishers in the Gouritsmond area mostly focus on the marine zone, there is some subsistence fishing effort in the estuary, mostly around "Witkopklop". In addition, there was evidence of fishing by farm labourers upriver in the vicinity of "Die Eiland".

8.3.3 Illegal fishing activities

While a host of specific fishery regulations have been implemented nationally to maintain a healthy fishery, a history of disregard for the regulations is thought to be a major contributor to the poor fishing in the estuary. Steve Lamberth (MCM) highlighted that anglers frequently retain undersize fish, exceed their bag limits and sell their fish. Boat anglers were also recognized as the group mostly responsible for the illegal activities. Approximately 30% of all user groups fish without licenses. Recently, at least one boat has been recognized to be involved in illegal gillnetting and at least one arrest has been made by MCM. In this case two large (100 m) monofilament gillnets were confiscated from a licensed seine net operator. Fish captured in the nets included: 332 mullet of a range of species, 46 leervis (*Lichia amia*), 61 spotted grunter (*Pomadasys commersonii*), 2 dusky kob (*Argyrosomus japonicus*), 3 dassies / kolstert (*Diplodus sargus*) and 13.5 kg of white seacatfish (*Galeichthys feliceps*).

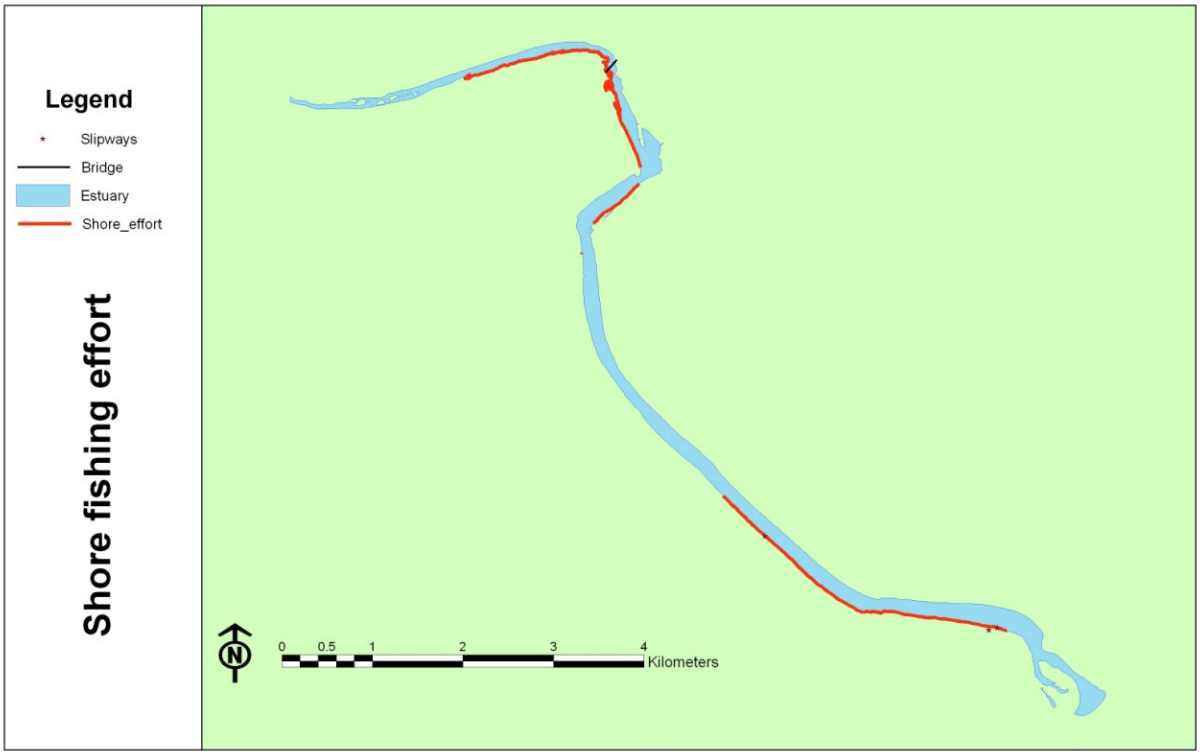

Figure 8.3 Shore fishing effort in the Gouritz Estuary.

8.3.4 Catch per unit effort

In the absence of any fishery survey, catch-per-unit effort data is not available.

8.4 BAIT FISHERY

Bait organisms in the Gouritz Estuary are targeted by recreational boat, recreational shore and subsistence anglers. Of the bait organisms found in the estuary, mudprawn and mullet are most frequently harvested by anglers. Sand mussel, sardine and squid were commonly used by anglers, but not captured in the estuary. Rock and surf anglers also collect bait (mostly live bait) in the estuary.

Unlike large, open systems in built-up areas (e.g. Kowie and Swartkops), there is no notable subsistence bait fishery at the Gouritz and anglers mostly collect their own bait on site. None of the resorts at Gouritsmond sell bait to guests, and although the local store sells marine bait organisms (e.g. sand mussel, redbait and pilchard) no estuarine bait organism are available.

8.4.1 Distribution of effort

Bait collection effort is focused around the lower reaches of the estuary. Here recreational boat, recreational shore and subsistence fishers collect mudprawn and livebait. Recreational shore and subsistence fishers mostly collect bait from just below the slipway to Witkopklip on the western shore. Recreational boat anglers collect mudprawn wherever they occur. Sand prawns are mostly found and harvested in the upper reaches of the estuary. Shore anglers can gain access to the river above and below the road bridge to collect sandprawn, while boat anglers can only access them in the “Bar se Gat” area, as the estuary is too shallow to

navigate further upstream. Mullet occur throughout the estuary with shore fishers mostly targeting them between the slipway and Witkopklip and boat anglers targeting them throughout.

8.5 CURRENT FISH AND BAIT REGULATIONS

The most recent linefish and bait regulations that apply to the Gouritz estuary, as well as those to be proposed for the EMP are presented in Table 8.1.

Table 8.1 National linefish and bait regulations and proposed local regulations for the Gouritz estuary.

Common Name	Fish Species	Size limit	Bag Limit	Other proposed regulations			
Cape stumpnose	*Rhabdosargus holubi*	20cm	5	Ban on night fishing	Closed season	Maximum size limit	Closed area
Shad	*Pomatomus saltatrix*	30cm	4*				
Leervis	*Lichia amia*	70cm	2				
Dusky kob	*Argyrosomus japonicus*	60cm	1				
Mullets	Mugilidae	None	50				
Spotted grunter	*Pomadasys commersonnii*	40cm	5				
Springer	*Elops machnata*	None	5				
White steenbras	*Lithognathus lithognathus*	60cm	1				
Common Name	**Shellfish and Bait Species**	**Size limits**	**Bag Limits**	**Other and proposed regulations**			
Cuttlefish	*Sepia spp.*	None	2	by hand or line			Closed area
Mud crab	*Scylla serrata*	140mm		by hand or line, no females in berry may be kept			
Mud prawn	*Upogebia spp.*	None	50	by hand, suction pump or tin			
Sand prawn	*Callianassa spp.*	None	50	by hand or suction pump			

*** Closed season for this species between 1st of October and the 30th of November.**

While the existing regulations have been implemented nationally in an attempt to maintain a healthy fishery, a history of disregard for the regulations is thought to be a major contributor to the poor fishing in the estuary. Steve Lamberth (DEA&T:MCM; Pers. Comm.) highlighted that anglers frequently retain undersize fish, exceed their bag limits and sell their fish. Recently, at least one boat has been recognized to be involved in illegal gillnetting and several reports of illegal gillnetting have been received by MCM. Boat anglers were also recognized as the group mostly responsible for the illegal activities. Approximately 30% of all user groups fish without licenses. The biggest problem in the immediate future was seen as the lack of capacity (manpower and capability) to enforce regulations, and the threat of increased gill netting.

8.6 MONITORING AND ENFORCEMENT

Enforcement and monitoring of living resource exploitation on the Gouritz estuary is practically non-existent, with MCM officers patrolling the system about twice a year. The Hessequa Municpality has appointed a single River Control Officer to issue and enforce boat licenses and to monitor other by-laws. The officer is however not appointed in terms of the MLRA and is thus unable to enforce the Act as it applies to living resource regulations. Cape Nature is responsible for ensuring compliance with regulations pertaining to the construction of structures (slipways and jetties) on the estuary in terms of the Seashore Act.

8.7 ANGLER AND RESIDENT PERCEPTIONS

Co-management of the estuary under the local management institution (Gouritz River Conservation Trust) with direct involvement all key stakeholders was seen as being a feasible option by most fishers. However, the lack of current institutional support with regards to enforcement of the MLRA is seen as a major stumbling block. All respondents agreed that there were fewer and smaller fish today than in the past. The last ten years, in particular have been highlighted as very poor years for angling. Fishermen felt that the current regulations pertaining to fish and bait exploitation would be effective if they could be enforced. However, the lack of compliance to regulations by fishermen was not seen by them as a major factor contributing to the decline in fish catches. Overall, fishermen felt that silting caused by reduced flows and increased erosion, and the trawlers operating in the inshore marine environment were mostly responsible for the decline in the fishery.

8.8 STRENGTHS AND OPPORTUNITIES

- The Gouritz River Conservation Trust is a well represented, well structured and proactive organization.
- There were good levels of public participation in the resource utilization survey. Consequently, there is adequate knowledge of the natural resource exploitation in the estuary.
- As a result of public education drives (eg. signboards), the majority of fishers have knowledge of the ecological functioning of the estuary.
- Most fishers have knowledge of the current fishery and bait collecting regulations, so rigorous public education drives are not necessary.
- Fishing competitions are only allowed after obtaining permission from the Municipality and the Gouritz River Conservation Trust. Consequently, the number of fishing competitions has been reduced, with none in the last two years.
- There is an existing scientific monitoring program in place (MCM – fish; CSIR – water quality), to enhance our knowledge of the estuarine system.
- There are many natural closed areas for shore angling and bait collecting due to lack of access. This creates natural closed areas in the estuary.
- There is very limited access to the estuary. The one slipway and reduced number of access points to the shore fishing areas provides an excellent prospect for cost effective law enforcement.

8.9 WEAKNESSES AND THREATS

- There is little scientific information (scientific publications, reports and popular articles) available for the estuary, so overall, there is a poor understanding of natural resources and their exploitation in the estuary.
- There is general consensus amongst river users that there has been a marked reduction in catches in the last ten years; consensus on the cause appears to be lacking.

- At present there is limited monitoring and enforcement for all sectors and the River Control Officer is not appointed in terms of the MLRA to inspect catches.
- As with all estuaries, there is a general lack of compliance to all of the fishery and bait regulations.
- A number of illegal activities, such as gillnetting have been reported in the estuary in recent years. These activities place much additional pressure on the living resources.

8.10 THE WAY FORWARD

There is a distinct feeling amongst the majority of river users that the fishery is declining and that the current regulations or the non-compliance with regulations should be addressed at a local level. However, since the current national linefish regulations have been developed for the whole country, they are not area specific. In the case of the Gouritz estuary, local issues such as the removal of large dusky kob by fishers must be considered when developing a management plan. Estuary specific fishery regulations may therefore be addressed in the EMP. The problem of poor law enforcement capacity on the estuary should also be addressed in the management plan.

The current size and bag limit regulations governing the exploitation of living resources are generally not considered effective in areas with poor enforcement capacity. Alternatively, closed areas and closed seasons are considered more effective and are therefore likely to be more suited to the Gouritz estuary. When deciding on the most appropriate strategy during the stakeholder workshop, it will be critical to consider each proposed regulation in its entirety, including its socio-economic consequences, benefit to the environment, general acceptance amongst users and ease of enforcement.

There are a number potential fish and bait regulations, and proposals to enhance the monitoring capacity on the estuary that must be considered during the stakeholder workshop. Given the poor stock status of dusky kob in South Africa, potential regulations for this species include a zero bag limit, a closed season, a window size limit, a ban on night fishing, and an estuarine protected area (Table 8.1). For the bait fishery, a closed area or a harvesting rotation system are proposed. Furthermore, the potential for poverty alleviation in the form of a subsistence bait fishery during high effort months (April and December) could be investigated.

The issue of monitoring and policing is also an important component of the management plan. Most respondents in the interviews felt that the current laws and regulations would be sufficient if there was greater compliance. However, the degree of compliance is directly proportional to the amount of effective monitoring and enforcement.

9. WATER QUANTITY AND QUALITY REQUIREMENTS

9.1 NATIONAL AUTHORITIES

Key organisations involved with water management in the Gouritz River Catchment at a National level are:

- DWAF, RDM Office, Pretoria (Contact: Jackie Jaye)
- Dam Safety Office, Pretoria (Contact: Alan Chemaly)
- DWAF, Options Analysis (Contact: Isa Thompson)
- DWAF, Engineering Services (Contact Ms Henriette Anderson)
- DWAF, Civil Engineering (Contact: Dr Chris Oosthuizen)

- DWAF: Dam Surveillance (Contact: Mr Peter Nightingale)

9.2 PROVINCIAL AUTHORITIES

The Gouritz River Catchment falls mainly in the Western Cape Province, but includes small portions of the Eastern Cape Province and Northern Cape Province. Water resources in the catchment are managed mainly by the following provincial authorities:

- DWAF Subdirectorate: Gouritz Water Management Area (Contact: Jannie van Staden)
- PRWK: Regional Planning; P Bag X9083, Cape Town (Contact: Willem Smith)
- Dept Agriculture: Western Cape, P Bag X1, Elsenburg. (Contact: AS Roux)
- Dept of Land Affairs, P O Box 872, George (Contact: Barry Levinrad)
- DWAF, Western Cape: Water Use Licensing (Contact: Johan Visser; Deon Hassbrook; Patrick van Coller)
- DWAF, Western Cape – water quality related water use (Contact: Patrick van Coller)
- DWAF, Western Cape – dam safety (Contact: Johan Visser)
- Cape Nature (Contacts: Ivan Donian; Pierre de Villiers; Teresa van der Westhuizen)

9.3 REGIONAL AUTHORITIES

There is currently a general review being undertaken regarding the alignment of water management institutions following several developments, including pressure from National Treasury to limit the number of public entities (Willie Enright pers. comm..). Due to this the appointment of the governing board for the Gouritz Catchment Management Agency (CMA) has been kept back. The current proposal is that the Breede-Overberg and the Gouritz should be combined under one CMA governing board. The Breede-Overberg CMA is already established and the development of the Catchment Management Strategy (CMS) is under way. Having said this, the key organisations involved with water management in the Gouritz Catchment at a regional level are:

- Combined Breede-Overberg and Gouritz Catchment Management Agency – DWAF, Pretoria (Contact: Derek Weston)
- Garden Route/Klein Karoo District Municipality, P O Box 12, George (Contact Marlize de Bruyn)
- Commercial Forestry, P O Box 1210, George (Contact: Mrs. C.L. Milne)
- Southern Cape Land Committee (NGO), P O Box 9015, George, (Contact: N.Sixolo)
- Central Karoo District Municipality Private Bag X560, Beaufort-West (Contact: Willie Terblanche)
- Garden Route/Klein Karoo District Municipality P O Box 12, George (Contact: J. Westenraad)
- George Municipality, P O Box 123, George (Contact: Harold Basson)
- Local Authority , P O Box 12, George (Contact: Henry Hill)
- Overberg Water, P O Box 277, Heidelburg, (Contact: Dries Potgieter)
- Working for Water, P O Box 112, The Craggs (Contact: Pamela Booth)

9.4 LOCAL AUTHORITIES

Organisations involved with water management in the Gouritz Catchment at a local level include the following:

- Buffels River Forum, 9 Skool Street Laingsburg (Contact: Nocolene Rittels)

- Buffels River Sub-forum, P O Box 200, Ladismith (Contact: Jill Reinecke/Bob Reinecke)
- Calitzdorp Forum, P O Box 158, Calitzdorp (Contact: J.P.P Nel)
- Duivenhoks Forum, P O Box 142 Heidelburg (Contact: Mr Meyer)
- Klein Gouritz Forum, P O Box 11, Herbertsdale (Contact: Piet Britz)
- Klein Karoo Forum P O Box 290 Oudtshoorn (Contact: Marius Greeff)
- Prince Albert Forum, P O Box 48, Prince Albert (Contact: Deon Gouws)
- Small Farmers, 222 Parkweg, Oudtshoorn (Contact: L.Kruth)
- Gouritz River Conservation Trust (Mr Daan Swart)

9.5 CATCHMENT DESCRIPTION (Figure 9.1)

The Gouritz River Catchment, or Drainage Region J, drains an area of 45,134 km^2 and has a river length of 328 km, from its source in the Greater Karoo to Gouritz mouth, where it enters the Indian Ocean. The catchment has two distinct areas: a large, dry inland area that is comprised mainly of the Karoo and Little Karoo; and the smaller humid strip of land along the coastal belt. The following section, mostly extracted from the State of the Rivers Report (DWAF 2007), describes the four sub-catchments that comprise the Gouritz River Catchment:

- **Gamka sub-Catchment:** This area comprises the catchment of the Gamka River upstream of the confluence with the Olifants River, downstream of which the river is known as the Gouritz River. In general, surface water quality in this sub-area is naturally saline. Groundwater is used extensively for livestock watering and for domestic water supply. Main land-use comprises dryland and irrigated agriculture (lucerne, fruit, vineyards), grazing (ostriches and sheep) and conservation. The largest dams in this sub-catchment are Gamkapoort and Leeu-Gamka Dams. The total dam capacity is 80.4 million m^3, which represents 35% of the nMAR (DWAF 2005).

- **Groot sub-Catchment**: This area comprises the catchment of the Groot River down to its confluence with the Gouritz River. In general, surface water quality in this sub-area is naturally saline. Groundwater is used extensively for livestock watering and for domestic water supply. Main land-use comprises dryland and irrigated agriculture (lucerne, fruit, vineyards), grazing (sheep) and conservation. The largest dams in this sub-cacthment are Floriskraal and Bellair Dams. The total dam capacity is 82.4 million m^3, which represents 78% of the nMAR.

- **Olifants sub-catchment:** This area comprises the catchment of the Olifants River. In general, surface water quality from this catchment is good. Main land-use comprises dryland and irrigated agriculture (lucerne and pasture), grazing (ostriches and sheep) and conservation. The largest dams in this sub-catchment are Stompdrift and Kammanassie Dams. The total dam capacity is 112 million m^3, which represents 49% of the nMAR.

- **Gouritz sub-catchment**: This area comprises the catchment of the Gouritz River downstream of the above catchments. Main land-use comprises dryland and irrigated agriculture (lucerne and pasture), and grazing (cattle and sheep). There are no major dams in this catchment, partly because of water quality considerations (DWAF 2005). This portion of the river is characterised by a wide, sandy beds with shallow, laminar flows. The top end of the estuary is located about 10 km from the river mouth, within quaternary catchment J40E (Figure 9.2).

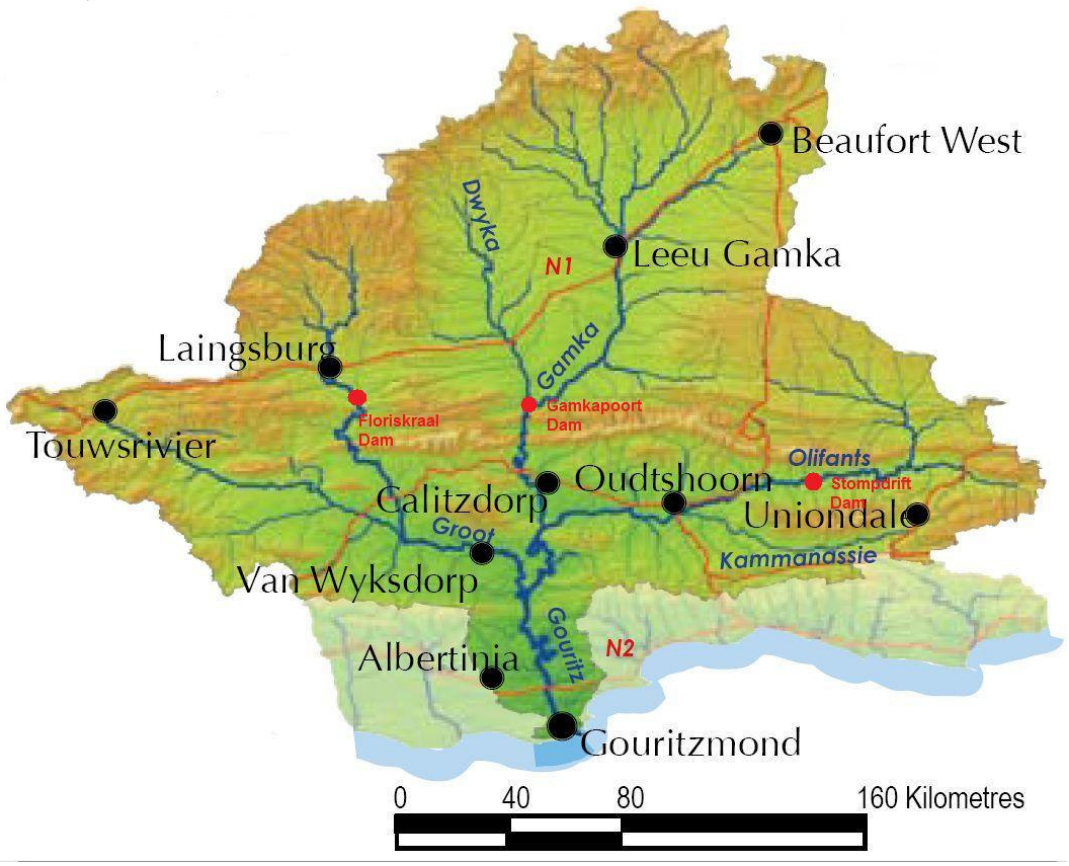

Figure 9.1 General locality map of the Gouritz River Catchment, showing the major tributaries, towns and dams (from DWAF 2007).

9.6 RIVER HEALTH

The overall Present Ecological State of the lower Gouritz River appears to be in a ***Moderate*** condition (DWAF 2007). Detailed information on aquatic invertebrates in the Gouritz River Catchment is available from the National River Health Database. However, the lowest biomonitoring site for which data are available (J4Gour-Herbe) is located 37 km upstream of the top end of the estuary (Figure 9.2). The ecological conditions of the river where it enters the estuary are therefore unknown. Aquatic invertebrates at J4Gour-Herbe were sampled on three occasions in 2004, and once in 2005. Overall the site appears to be in moderate condition for aquatic invertebrates, with total SASS5 scores ranging between 56 and 65, and the ASPT varying between 4.7 and 6.2. Taxa recorded are typical of a shallow, sand-dominated substrate, and include baetid mayflies, hydropsychid caddisflies, Corixidae and Gomphidae.

A total of 12 species of indigenous fish are expected at biomonitoring point J4Gour-Herbe, a further seven species of exotic or translocated fish are known to occur. The overall present state for fish is rated as *Poor*, mainly because of the high proportion of exotic species (DWAF 2007).

9.7 HYDROLOGY

9.7.1 Natural Hydrology

The simulated natural mean monthly total flows at the lower end of the Gouritz Catchment are shown in Figure 9.3. The data show moderate seasonality, with highest total flows usually in March, and lowest total flows in July. The nMAR for the Gouritz River Catchment at the lower boundary of quaternary catchment J40E is estimated at 564.0 million m^3/a (Desktop Reserve Model 2002). The average annual rainfall over most of the catchment varies between 100 and 300 mm, while the coastal area has an annual rainfall of 400 to 500 mm/a (BKS 2003).

The simulated monthly natural flows in the lower Gouritz River are shown in Appendix 2. The data indicate that natural flows in the system are highly flashy, as would be expected for a system that drains an area that is largely arid (Karoo). The lower Gouritz River is naturally seasonal (i.e., non-perennial), with flow cessation occurring in January and February in most years.

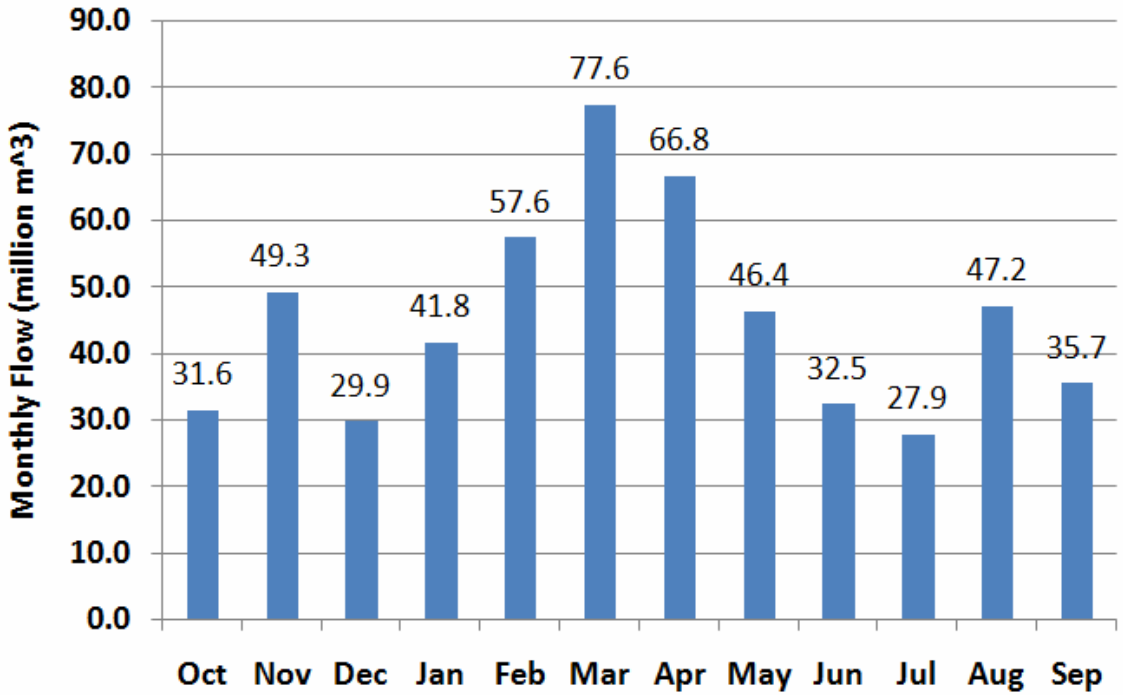

Figure 9.3 Simulated natural mean monthly total flow in the lower Gouritz River, at the lower boundary of Quaternary Catchment J40E (data extracted from Desktop Reserve Model 2002).

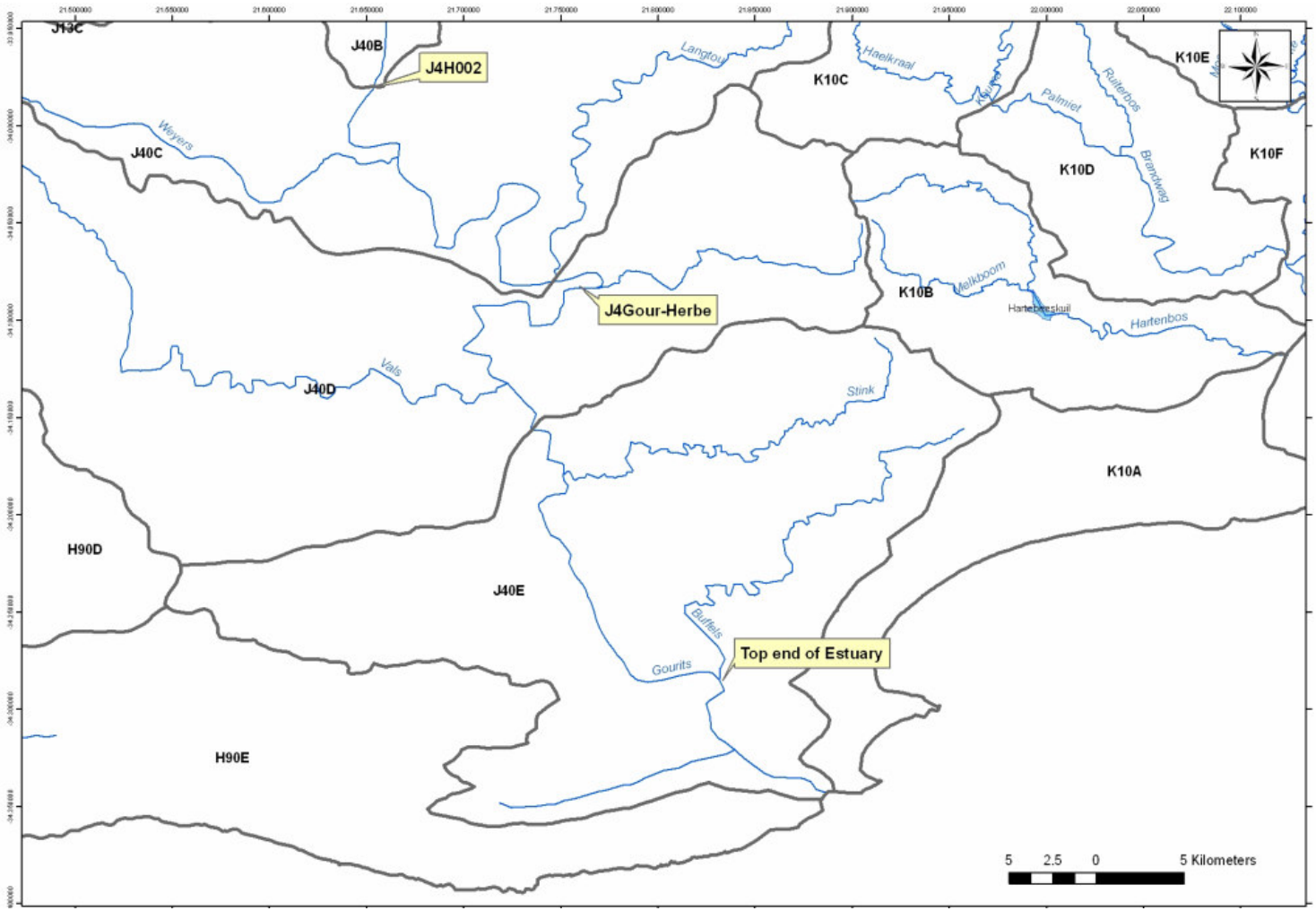

Figure 9.2 Lower portion of the Gouritz River Catchment, showing main rivers, quaternary catchments and key points mentioned in the text.

9.7.2 Observed Hydrology

Stream flow stations in the lower Gouritz River System are listed in Table 9.1. The longest periods of flow data are available for the Weyers River (42 years) and the Langtou River (28 years).

Table 9.1 List of stream flow stations in the lower Gouritz River System.

Code	River	Location	Grid (dd.mm.ss)		Start	Finish	Notes
J4H001	Gourits	Bonavontuur	34 11 08.3	21 45 11.1	1912/03/09	1931/07/31	No rating table
J4H002	Gourits	Zeekoedrift	33 58 49.0	21 39 12.0	1964/05/01	2008/04/08	11 years data
J4H003	Weyers	Weyers River	34 01 52.0	21 35 11.0	1965/04/13	2008/03/11	42 years data
J4H004	Langtou	Langfontein	33 59 15.3	21 46 35.1	1967/03/30	1996/11/20	28 years data

The lower Gouritz River has two flow gauges: one at Bonavontuur (J4H001) and one at Zeekoedrift (J4H002). The gauge at Bonavontuur has no rating table, so there are no flow data available. This means that the only available flow data for flows entering the estuary were recorded at Zeekoedrift (J4H002). This rated cross-section is located 70 km upstream of the top end of the estuary. The cross-section is located in a pool under a bridge, so low flows are likely to be unreliable. There are a number of tributaries that enter the river between this gauge and the estuary, but these are small tributaries, so the impact on flows is likely to be small. Gauge JH002 was operational for 14 years between May 1964 and October 1978, but there are several periods of missing data, so the total combined data comprises 11 years only. The results are summarised graphically in Figure 9.4. Although the units of measurement are not the same as those shown in Figure 9.3, it is clear that seasonal flow patterns have changed significantly compared to natural flows. Observed median monthly flows at J4H002 were typically 0.47 m^3/s, which is significantly lower that the comparable value of 2.187 m^3/s under natural conditions. These changes are not surprising, given the large number of dams that have been constructed in the catchment.

9.8 ECOLOGICAL RESERVE

The Ecological Water Requirements (EWR) of the Gouritz System has not been assessed in any detail. A workshop to discuss and quantify the ecological classification of each quaternary catchment in the Western Cape concluded that the Ecological Importance and Sensitivity of most of the Gouritz River Catchment is ***Moderate*** (Ninham Shand 2000). Likewise the Present Ecological State and the recommended (default) Ecological Management Category for the area was rated as ***Moderate*** (Ninham Shand 2000). However, more recent data indicate that some areas are in notably good condition. For example, the DWAF: River Health Programme (2007) indicates that the Jakkals River, near Herbertsdale, has a Present Ecological State and Desired Ecological Management Category of either Category A or B (i.e. *Natural to Largely Natural*).

The Department of Water Affairs and Forestry has conducted and formally approved a desktop assessment of the EWR of the lower Gouritz River, at the downstream boundary of quaternary J40D (DWAF 2003). The recommended EWR at this location, for a Category C management objective (i.e. Moderately Modified), was estimated at 98.649 million m^3/a (DWAF 2003). This represents 18.04% of the nMAR (DWAF 2003). This value is significantly higher than previous estimates: the proposal for the establishment of a Catchment Management Agency estimated the EWR of the lower Gouritz to be 41 million m^3 (DWAF 2005), whereas the Water Resources Situation Assessment gives a value of 71.6 million m^3 (Ninham Shand 2002).

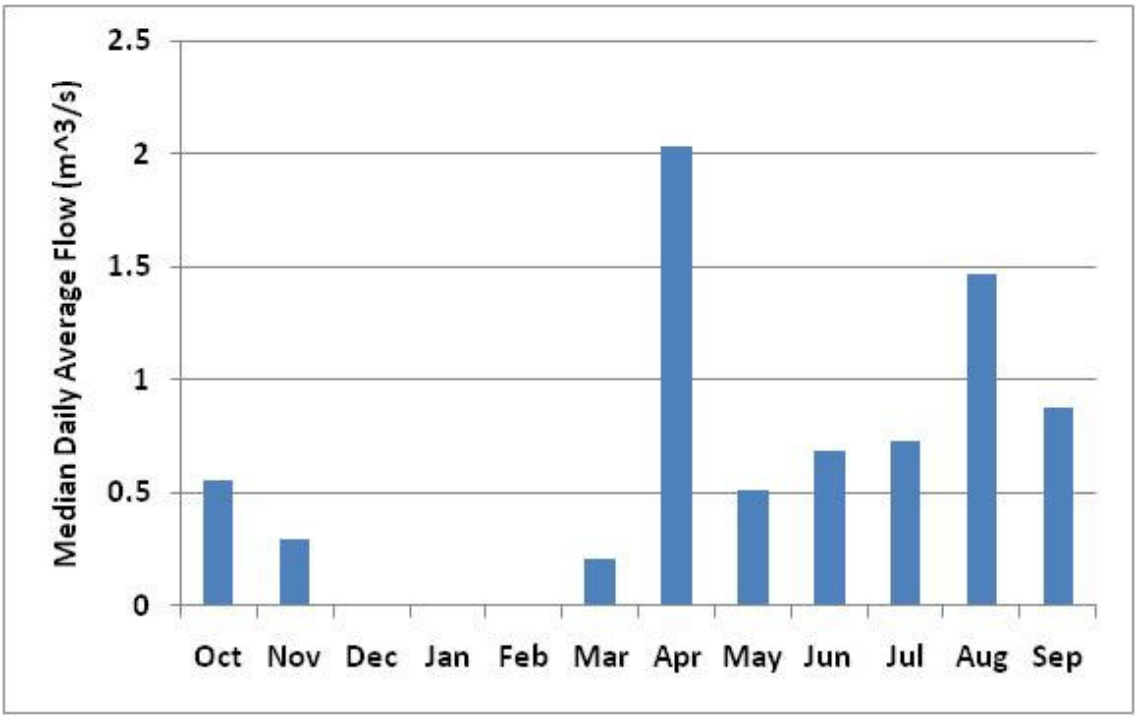

Figure 9.4 Median daily average observed flows in the Gouritz River at rated cross-section J4H002 (1964 to 1978).

The lower boundary of Catchment J40D is about 21 km upstream of the top end of the estuary. For the purposes of this study it was considered more appropriate to assess the EWR further downstream, and include the contributions of the tributaries in the lower reaches, such as the Buffels and Stink Rivers. The Desktop Reserve Model was therefore run cumulatively at the lower boundary of J40E (i.e. the entire catchment). The results are shown in Appendix 2. The recommended EWR for a Category C management objective (i.e. Moderately Modified), was estimated at 101.864 million m^3/a, which is comparable to the results of the EWR at J40D that has been formally approved by DWAF. These flows represent 18.06% of the nMAR. The median EWR varies between 0 million m^3 per month (in January and February), to 2.903 million m^3 per month in March. The median lowflow requirement in March is 0.292 million m^3, equivalent to a flow of 109 L/s.

A rapid Level II assessment of the EWR was undertaken for the Weyers River at the lower boundary of quaternary catchment J40C. The assessment was based on a Category B management objective (i.e. *Largely Natural*). The EWR for this catchment was estimated to be 2.89 million m^3/a, which represents 28.4% of the nMAR (DWAF 2007). This is not

unusually high, as smaller rivers tend to have a proportionately higher EWR than larger streams.

There are no immediate plans to undertake a higher confidence assessment of the EWR for the Gouritz River Catchment, although there are some priority areas, such as Oudtshoorn, that will receive attention as part of the water reconciliation plan, which is currently in Inception Phase (Toni Belcher, Pers.Comm.).

9.9 WATER USERS

Irrigated agriculture is the biggest single user of water in the Gouritz River Catchment, estimated to use about 83% of the water requirements (Table 9.2). However, although large areas can be irrigated, large areas remain fallow for most of the time and are only irrigated in years of high runoff, when sufficient water is available (BKS 2003).

The construction of illegal barriers in the lower reaches of the river also prevent freshwater from reaching the estuary and all the farms bordering the river pump water whenever it is available.

9.10 WATER BALANCE

Comparison of water availability and water requirements in 2000 indicates that that demands exceed availability, to the extent that some towns experience water shortages (BKS 2003). However, the efficiency of irrigation in some areas is very low, and substantial losses occur in some distribution networks, such as Beaufort West (BKS 2003). Water use by alien vegetation is also high, particularly along the coastal belt.

9.11 WATER STORAGE

The main dams in the Gouritz River Catchment are listed in Table 9.3. The total reservoir capacity is estimated at 274.8 million m^3, equivalent to 49% of the nMAR. However, a significant proportion of the capacity comprises sediment accumulation. For example, Floriskraal Dam is estimated to contain at least 22.9% sediment (DWAF 1986). Most of the dams are owned by the Department of Water Affairs and Forestry. The largest dams are located about 200 km upstream of the estuary. This means that the feasibility of releasing low flow estuarine requirements from existing dams is remote, as water released from the dams is likely to be abstracted from the river before it reaches the estuary. However, the existing large dams could play an important role in providing high flow requirements for the estuary, providing the outlet capacities are big enough.

9.12 PHYTOPLANKTON

Examination of Google Earth satellite imagery shows a distinct change in river water colour a short distance (1.4 km) downstream of the junction of the Vals River. The Gouritz River upstream of this junction appears to be tea-brown in colour, whereas downstream of this point the river is distinctly green. The Vals River would therefore appear to be contributing elevated nutrients into the system. The most likely source of elevated nutrients is from agricultural runoff, as there does not appear to be any other significant activity in this catchment.

Table 9.2 Summary of water requirements of the Gouritz Catchment in 2000 (Data from BKS 2003).

	EWR	Water Use	Water Requirements					
Sub- area		**Alien Vegetation**	**Irrigation**	**Rural**	**Urban**	**Power generation**	**Afforestation**	**Total**
Gamka	2.50	0.3	49.2	1.9	4.8	0	0	58.70
Olifants	2.70	4.1	61.6	3.3	9.2	0	0	80.90
Groot	0.90	1.0	48.9	2.4	1.5	0	0	54.70
Lower Gourits	6.10	1.4	22.3	1.4	.4	0	0	31.60
Total	**6.10**	**6.8**	**182.0**	**9.0**	**15.9**	**0**	**0**	**219.80**

EWR=Environmental Water Requirement

9.13 WATER QUALITY

Water quality in the lower reaches of the Gouritz River is very poor and unacceptable for most uses because of naturally high levels of salinity. The median salinity at gauge J4H002 was 2882 mg/l, with a maximum of 6031 mg/l (Ninham Shand 2002). The Present Ecological State of the river is moderate, despite the poor quality water, and this indicates that the organisms have adapted to the high salinities.

Table 9.3 List and details of dams in the Gouritz River Catchment.

Dam	River	Quaternary	Storage capacity (million m^3)	Owner
Groot Sub-catchment				
Floriskraal	Buffels	J11F, G, H	50.3	DWAF
Bellair	Brak	J12K	10.1	DWAF
Vekeerdevlei	Donkies	J12B	5.5	DWAF
Prins River	Prins	J12G	2.7	Prins River Irrigation Board
Gamka Sub-catchment				
Gamkapoort	Gamka	J25A	44.2	DWAF
Leeu Gamka	Leeuw	J22K	14.3	DWAF
Calitzdorp	Nels	J25D	4.8	DWAF
Doornfontein	Leeuw	J22G	4.4	Private
Oukloof	Dorps	J23E	4.2	DWAF
Gamka	Gamka	J21A	1.8	DWAF
Olifants Sub-catchment				
Stompdrift	Olifants	J33B	55.3	DWAF
Kammanassie	Kammanassie	J34E	35.8	DWAF
Koos Raubenheimer	Klein le Roux	J35A	9.2	Oudtshoorn
Melville		J35A	0.4	Oudtshoorn

9.14 CONCLUSIONS

9.14.1 Catchment Management

There is uncertainty as to who will be responsible for managing water resources in the Gouritz Catchment. The current proposal is that the Breede-Overberg and the Gouritz should be combined under one CMA governing board. It is likely to be difficult to implement any significant changes to the current water management in the catchment until this issue has been resolved.

9.14.2 Water Quality

Water quality in the lower Gouritz River is naturally saline, and unsuitable for most uses. The aquatic invertebrates in the river are therefore characterised by hardy, tolerant taxa.

9.14.3 Freshwater Inflows

Simulated hydrology indicates that the lower Gouritz River was naturally seasonal, with flow cessation typically occurring in January and February. The natural Mean Annual Runoff (nMAR) is estimated to have been 564.0 million m^3/a. The natural hydrology of the catchment is extremely flashy and seasonal, so the environmental requirement is made up mainly of high flows (freshets), and there is no justification for providing a steady minimum baseflow.

The present day runoff is unknown, but there are numerous dams in the catchment, which together impound an estimated 49% of the nMAR. The recommended Ecological Water Requirement (EWR) needed to maintain the lower end of the Gouritz River in an Ecological Category C (i.e. Moderately Modified), is estimated to be to be 101.864 million m^3/a (i.e 18.06% of the nMAR).

There are currently no operational flow gauges that are able to measure freshwater inputs into the Gouritz Estuary. It is therefore currently not possible to monitor EWR compliance. Furthermore, the closest major dam is about 180 km upstream, and it is not known if the outlet capacities are sufficient to release the recommended environmental releases.

9.14.4 Barriers

The potential problem for farmers of saltwater intrusion from the estuary into the lower reaches of the river appears to have been inadvertently alleviated to some extent through the construction of a barrier across the estuary above the Road Bridge. The barrier appears to be beneficial to farmers in that it retards saltwater intrusion and they can safely pump water from the river for irrigation. The problem with this is that the barrier breaks down the REI, makes the estuary a marine dominated arm of the sea and restricts freshwater flow into the estuary. They may also provide a barrier to certain fish such as *M. capensis* and *Anguilla* spp. which migrate from the estuary into freshwater during certain phases of their life history.

9.15 RECOMMENDATIONS

9.15.1 Develop Operational Rules that Include Ecological Water Requirements

Environmental Water Requirements should be incorporated into the operational rules for the larger dams in the catchment, such as Floriskraal, Gamkapoort, Stompdrift and Kammanasie. A rainfall monitoring system should be developed in which environmental releases from the dams should be made in response to rainfall triggers. This should be the responsibility of the Catchment Management Agency. An important aspect of this that needs to be addressed is the capacity of the dams to release the recommended high flows.

9.15.2 Monitor Freshwater Inputs

Freshwater inputs into the estuary should be monitored continually using a water level data logger installed at a rated cross-section located in the gorge at lower end of the river.

9.15.3 Fish Ladder

Fish ladders should be installed at all barriers across the estuary and lower river region to allow for the upstream migration of fish species. Priority should be given to barriers that are closest to the estuary as more species are affected.

10. CLASSIFICATION, ECONOMIC VALUE, PROTECTION AND REHABILITATION

10.1 CLASSIFICATION

The Gouritz is a warm temperate, medium/large permanently open, tidally dominated, barred estuary that displays a moderate ichthyofaunal community, good water quality and only moderate aesthetic appeal (Whitfield 1992; Harrison *et al.* 2000); overall condition was rated as Good by Whitfield (2000) although he does remark that freshwater supply is severely curtailed. In a more recent study by Turpie and Clark (2007), the Gouritz estuary was not ranked in the top 40 estuaries in South Africa; its overall importance score was 75 with the number one rated estuary (Knysna) rated at 100. These ratings are based on a combination of scores given to size, habitat importance, zonal type rarity and biodiversity importance.

10.2 ECONOMIC VALUE

Turpie and Clark (2007) placed the following economic values on the Gouritz estuary:

Subsistence - ranked 16th amongst temperate systems; valued at R137 867 per annum; top value is the Swartkops estuary at R808 953.
Property – not ranked in the Top 20 in terms of property value related to estuaries; range of property value related to all temperate estuaries is between R1 million and R2 billion; most systems fall into the R10 – 50 million range.
Tourism – not rated in the Top 20 in terms of tourism value attributed to estuaries; total value for all temperate systems is R2.08 billion; most (probably including the Gourits) are between R10 000 and R1 million although 23 estuaries have an estimated tourism value of < R10 000.
Nursery – not rated in the Top 20 in terms of nursery value attributed to temperate estuaries but valued at between R1 and R5 million per annum; majority of temperate estuaries are valued between R100 000 and R10 million; top value is Knysna at R167.6 million.
Existence – is not ranked amongst the Top 40 temperate estuaries and only has a rating of Medium; existence value is largely associated with scenic beauty. Overall the value placed on the public's willingness to pay (WTP) for estuary conservation in SA for all income groups is R80 842 180.
Recreational – the recreational value is an estimate based on a combination of property and tourism values. The Gouritz is estimated at between R10 and 20 million per annum based largely on property value.

10.3 PROTECTED AREA STRATEGY AND POTENTIAL

10.3.1 Estuarine Protected Areas

The establishment of a core Estuarine Protected Area (EPA) network around the South African coastline should take into account the following goals (after Turpie and Clark 2007):

- Representativeness: all estuarine species within a bioregion should be represented in viable numbers in the protected areas network.
- Maintenance of ecological processes: the protected area network should allow for connectivity and interaction with other adjoining ecosystems.

- Maintenance of fishery stocks: the protected area network should provide enough protection to exploited species that they are able to act as source areas for surrounding exploited areas.
- Minimization of economic opportunity costs: biodiversity targets should be met at least possible opportunity cost, through careful selection of the estuaries included in the protected area network. Estuaries where protection offers greatest economic benefits or lowest economic costs should be prioritized in the EPA selection process.
- Implementabilty: consideration should be given to the practicalities of protection in each estuary.

The biodiversity protection targets addressed in Sections 10.3.2, 10.3.3 and 10.3.4 below address the first three goals listed above. The final choice of estuaries that will be used as part of an EPA network that will realize these targets will be subject to the final two goals listed above.

10.3.2 Protection of habitat types

Targets for the protection of estuarine habitat types (as a percentage of the total estuarine habitat measured in hectares) have been recommended by Turpie and Clark (2007). The percentages for habitat types which are represented in the Gouritz are as follows; supratidal salt marsh (30%); intertidal salt marsh (40%); reeds and sedges (20%); sand/mud banks (40%); submerged macrophytes (40%); and estuary channel (30%). The overall percentage of all estuarine habitat types combined that should be protected within all temperate systems is 30% of the total available 25 095 hectares.

10.3.3 Protection of fish and bird species

Similarly targets for the protection of fish and bird species (as a percentage of the total National population) were set at 50% of the population for red data (threatened) species; 40% of the population of exploited species; and 30% of the population of all other species. The effective targets for selected individual species that are associated with the Gouritz are provided in Table 10.1 (after Turpie and Clark 2007). Amongst the bird species only the African Black Oystercatcher is listed as threatened (not recorded in any surveys but is known to occur in the region); the remaining species all fall under the 30% protection target. No red data fish species are listed but all those that are considered to be heavily exploited, such as dusky kob, spotted grunter, white steenbras, white stumpnose and mullet species are targeted for 40% protection of the population.

10.3.4 Protection of ecosystem and landscape-level processes

The protection of habitat types and associated fauna in estuaries may only be considered effective if the populations benefiting from these measures are viable, that is to say that they are sufficiently large and there is a degree of overlap between protected areas/populations to ensure the maintenance of genetic integrity and evolutionary processes. In order to achieve this, Turpie and Clark (2007) recommended the following measures which would also serve to help maintain landscape-level processes that maintain ecological integrity at a large scale (relevance to the Gouritz estuary is also provided):

- Viability: EPAs should protect a minimum of 33% of each habitat within an estuary as a no take sanctuary. Although this may not be a realistic measure it is potentially attainable due to the rural location of the Gouritz estuary and the low level of development and recreational use of the various habitat types.

- Viability: Systems in an unacceptable state of health should be excluded, particularly canalized systems. The Gouritz is in a good state of health according to Whitfield (2000) but only enjoys a moderate biodiversity importance rating of 75, placing it outside the Top 40 ranked estuaries in the country.
- Connectivity: There should be a relatively even distribution of protected estuarine area around the coast. A network of EPAs has yet to be set up and it is not known how the Gouritz would feature in this arrangement.
- Landscape level processes: Estuaries adjoining terrestrial or marine protected areas will be prioritized in the selection process, and those adjoining undeveloped land should be prioritized over those that are developed. Much of the land adjacent to the Gouritz is undeveloped in terms of structures but is used extensively for agriculture.
- Viability: ecosystem processes, evolutionary processes and representativeness: Large open systems should be prioritized over smaller systems but a range of different sized estuaries should nevertheless be represented. The Gouritz is a medium/large open system.
- Efficiency: Systems with higher conservation importance scores should be given greater priority. The Gouritz only has a moderate score (75) in this regard.

Table 10.1 National target percentages for the protection of estuarine associated fish and bird species known to occur at the Gouritz estuary (after Turpie and Clark 2007).

FISH SPECIES	TARGET %		BIRD SPECIES	TARGET %
Anguilla mossambica	30		White-breasted Cormorant	30
Argyrosomus japonicus	40		African Black Oystercatcher	50
Atherina breviceps	30		Common Ringed Plover	30
Galeichthys feliceps	30		White-fronted Plover	30
Gilchristella aestuaria	30		Terek Sandpiper	30
Lichia amia	30		Common Sandpiper	30
Lithognathus lithognathus	40		Curlew Sandpiper	30
Liza dumerilii	40		Common Greenshank	30
Liza richardsonii	40		Red Knot	30
Monodactylus falciformis	30		Little Stint	30
Mugil cephalus	40		Bar-tailed Godwit	30
Myxus capensis	40		Common Whimbrel	30
Pomadasys commersonnii	40		Water Thick-knee	30
Pomatomus saltatrix	40		Kelp Gull	30
Rhabdosargus holubi	30		Caspian Tern	30
Solea bleekeri	30		Swift Tern	30
			Common Tern	30
			Bar-tailed Godwit	30
			Grey Plover	30

10.3.5 Type or level of protection

The study by Turpie and Clark (2007) concluded that in order for conservation targets and goals to be achieved, 80% of temperate estuaries needed some form of partial protection rather than a few with total protection; in many instances this was because the benefits of partial protection were seen to outweigh the management and opportunity costs. Furthermore it became apparent that a greater level of protection of estuaries would be desirable from a socio-economic perspective than would be necessary just in order to meet biodiversity

conservation targets. The partial protection of 80% of estuaries was also deemed desirable from a management perspective, in that it would facilitate the introduction of an almost universal sanctuary zone in each estuary which is marked by standard markers, which in turn would facilitate public awareness about the estuarine protection system.

Initial guidelines for the conservation of estuarine biodiversity (Turpie 2004) required that estuaries be assigned to one of three categories, namely:

- Estuarine Protected Areas (EPAs) - part or all of an estuary is a sanctuary, providing protection from consumptive use; state-run; selected with both biodiversity representation and socio-economic considerations in mind;
- Estuarine Conservation Areas (ECAs) - co-managed estuaries in which general regulations are augmented by estuary-specific regulations; initiated by local communities through estuary forums which would also design zonation schemes and bylaws; likened to the role of private nature reserves and conservancies in the protection of terrestrial biodiversity, and are generally not considered to contribute to protected area conservation targets because their contribution to conservation is less secure in the long term; and
- Estuarine Management Areas (EMAs) - to which general regulations apply; at least must have a management plan in order to facilitate compliance with general regulation and maintain estuarine health at an acceptable level.

However, due to complications that arise between fully and partially protected systems with respect to national legislation and the subsequent administration of EPAs and ECAs it has been recommended that the above categories be scrapped and that zonation be used instead as a general strategy in the management of estuaries (Turpie and Clark 2007). Essentially this means that the estuaries selected to form part of an overall protection network should contain a sanctuary zone and should receive sufficient protection and sufficient quantity and quality of freshwater inflows to be maintained in an appropriate state of health.

The zonation strategy means that individual estuaries may contain a fully-protected (sanctuary) area which would include terrestrial margins, and a conservation area that would be zoned according to the vision and objectives/requirements for that estuary. Sanctuary areas would fulfill the same function as an EPA and as such would have to be set up and managed by an organ of the state. Conservation areas may be managed by a wide variety of styles within a co-management setup where the community and an estuary management forum are the main role players. By adopting a system like this on all selected estuaries, it is likely to be easier and more efficient to manage the entire network, especially if similar rules apply and similar markers and mapping styles are used in all estuaries to denote sanctuaries and other types of use zones (Turpie and Clark 2007).

10.3.6 The Gouritz in perspective

Based on the findings of Turpie and Clark (2007), the following can be said about the Gouritz estuary with regards to requirements in terms of protection:

- The Gouritz is one of the core set of temperate estuaries required to meet the targets for biodiversity protection of estuarine resources; scores (out of 100) that contributed to the overall rating of 75 for the Gouritz were size (90), habitat importance (60), zonal type rarity (20) and biodiversity importance (88).
- The recommended extent of sanctuary protection is HALF the system.

- The recommended extent of undeveloped margin is 50%; an average score for public perception of optimal level of development around SA estuaries was 40%.
- The recommended minimum water requirement falls under the A/B management class which means a high priority and requirement.
- The priority for rehabilitation is HIGH.

Preliminary thoughts on a zonation plan for the Gouritz (Figure 10.1) are that a sanctuary area be declared above the low road bridge and that the remainder of the estuary be declared a conservation zone which will further be divided into specific management areas. The proposed sanctuary area would only comprise the estuary itself and not the adjacent land as this is mostly highly elevated above the channel. In addition, the rationale behind the sanctuary is the protection of a nursery area for juvenile fish such as dusky kob, white steenbras and spotted grunter. The conservation zone, which makes up most of the estuary, will comprise areas where activities are regulated to prevent over-exploitation, to ensure responsible non-consumptive recreational use and to ensure sustainable development. The surface area of the four zones is as follows; zone 1 – 345 434 m^2; zone 2 – 219 708 m^2; zone 3 – 1 190 816 m^2; and zone 4 – 299 041 m^2.

Saltmarsh does not comprise a significant portion of estuarine habitat and is largely confined to the lower reaches. Large portions of what once was pristine saltmarsh have now been altered by farming activities and no longer fulfill their original function. These large transformed areas extend over the middle reaches floodplain. Much of the remaining area of saltmarsh on the west bank falls within the existing Gouritsmond Commonage and appears to managed effectively; this includes rehabilitation of old pathways and 4x4 tracks and the demarcation of a single pathway for hikers and fishermen. The area can continue to be managed as it is and does not require any additional input from the EMP. However, the saltmarsh on the eastern side is still abused by indiscriminate trampling and driving and the management of the middle reaches must include actions to rectify this. Mudbanks and sandbanks are found along much of the lower/middle and upper reaches respectively. Mudbanks do not need any special protection status and a portion of the sandbanks in the upper reaches will be protected within the proposed sanctuary area.

The skiing area falls within a multi-use area that is open to all activities except swimming, which is confined to a section along the western shore at the mouth, and fishing from a boat as this will interfere with the safe conduct of skiing operations. A 20 m safety zone on either side of the slipway is also recommended from a safety aspect.

The greater catchment area is generally considered to be in good condition but there are serious issues relating to water supply and abstraction and soil erosion leading to increased sediment loads. The area will benefit through the Gouritz Initiative, but this may take some time. It is imperative that dedicated catchment management plan run through a catchment management agency be implemented so that estuary-specific issues that rely on good catchment management can be addressed. The EWR or ecological reserve needs to be determined as a matter of urgency and then a programme initiated that will ensure measured releases and pulses of freshwater that will not only help sustain farmers in the lower river regions but also help sustain ecological processes.

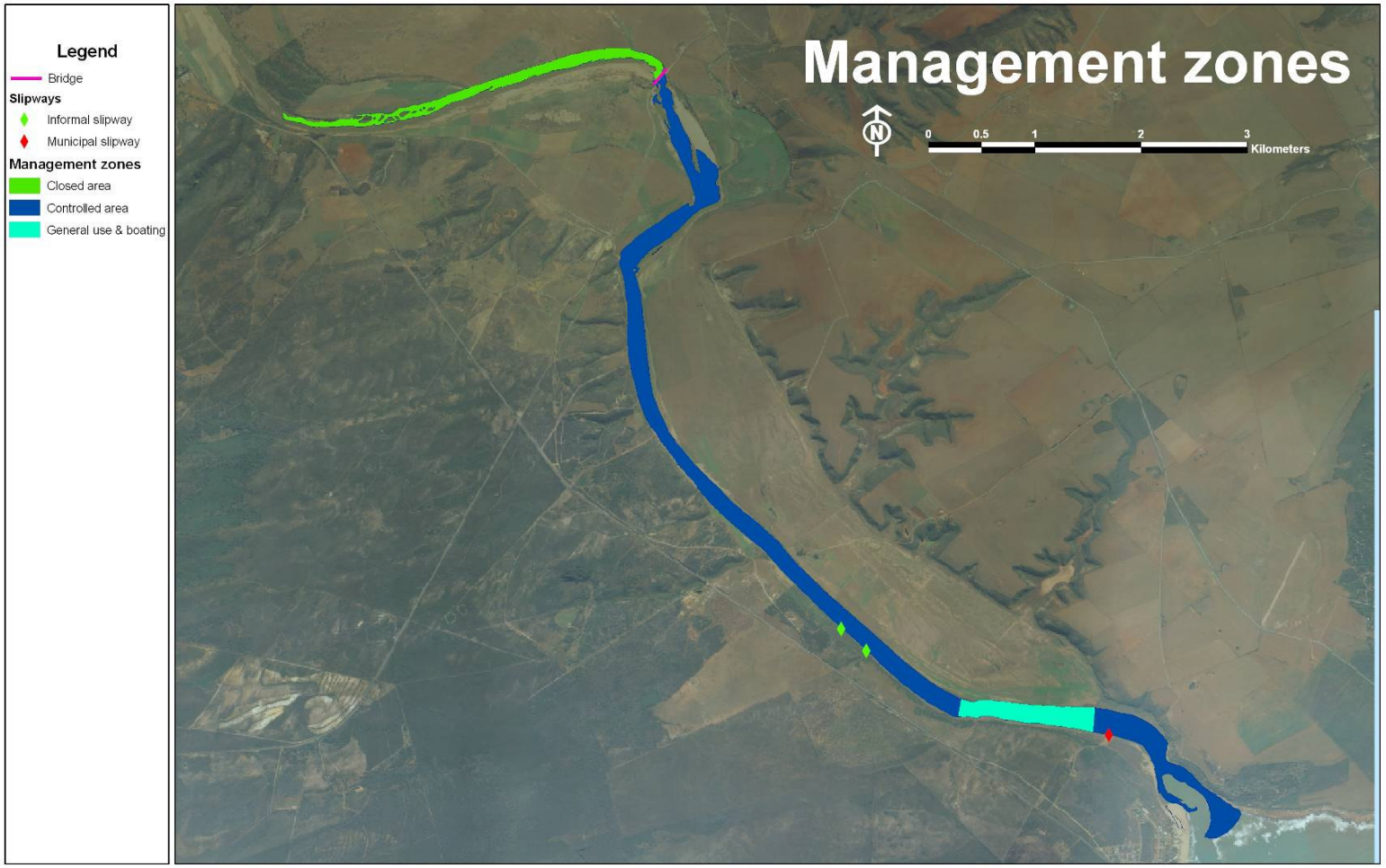

Figure 10.1 The proposed Estuarine Zonation Plan for the Gouritz estuary showing the closed area above the bridge and the conservation areas that will allow a variety of controlled activities.

10.3.7 Boat carrying capacity

The carrying capacity for the three conservation zones of the Gouritz estuary with respect to boat use has been calculated in accordance with the DWAF Recreational Water Use Manual Guideline (in CSIR 2007).

Zone one is a 34.5 ha limited access area, where no skiing is allowed. DWAF guidelines suggest that 4-8 ha is the minimum requirement per boat. Boats that are not being used for skiing require a minimum water depth of one meter. Since the margins of zone one are shallow, the area 10 meters from the shore was not considered suitable for boats. Consequently, the area suitable for boating in zone one was estimated at 29 ha. With a minimum of four ha required per boat, and the average trip time per non skiing boat user estimated to be about four hours, the maximum number of boats allowed per day in zone one is 26.

Zone two is a 22 ha open access area that includes skiing. DWAF guidelines suggest that 4-8 hectares is the minimum requirement per boat. Boats that are not being used for skiing require a minimum water depth of 1.5 meters. In zone two this corresponds to at least 10m from the shore. Consequently, the area for boating in zone two was reduced to 19 ha. With a minimum of four hectares required per boat, and the average trip time per skiing boat user estimated to be about three hours, the maximum number of boats allowed in zone two per day is 22.

Zone three is a 119 ha limited access area, where no skiing is allowed. Since the upper regions of this region and the areas 10 m from the shore are too shallow for boating activity, the suitable boating area was estimated to be 83 ha. DWAF guidelines suggest that 4-8 hectares is the minimum requirement per boat. With a minimum of four hectares required per boat, and the average trip time per non skiing boat user estimated to be about four hours, the maximum number of boats allowed in zone three per day is 79.

11. RESTORATION/REHABILITATION

A workshop attended by estuarine scientists and managers was held to determine which temperate estuaries should be prioritized for rehabilitation (see Turpie and Clark 2007) and which issues should be addressed in each estuary. A total of 50% of temperate estuaries were considered to be in need of some form of rehabilitation; these included systems ranging from a poor to excellent state of health. Thirty-nine estuaries, including the Gouritz were given a HIGH priority status for rehabilitation. According to the consensus opinion at the workshop the requirements for rehabilitation on the Gouritz estuary are water quantity and the clearing of alien vegetation; water quality (pollution and silt) and restoration of areas subject to inappropriate bank stabilization were not regarded as a priority.

12. THE WAY FORWARD: OBJECTIVE II

12.1 LOCAL ESTAURINE MANAGEMENT FORUM

Objective 2, which follows on immediately after the completion of this Situation Assessment Report involves the process of formulating an EMP for the Gouritz estuary through a workshop aimed at obtaining stakeholder input with regards the vision, objectives, management action plans and monitoring programmes. Ideally the EMP should be developed with the help of a constituted local management institution which represents all the relevant stakeholders and their interests. Such an institution is usually referred to as an Estuarine

Management Forum, however, the Gouritz River Conservation Trust is already in existence and has played a significant role in this process up till now. The Trust is a fully constituted body representing the community and headed by a chairman. It is thus likely that this Trust will be tasked with facilitating the implementation and running of the EMP. In accordance with the National Estuarine Management Protocol, the Trust would need to comprise the following if it were to conform to the requirements of an estuarine management institution (van Niekerk and Taljaard 2007):

- A chairperson, to be elected by the forum and to take the lead in the development and implementation of the local EMP.
- Technical Working Groups for each of the following key sectors:
  - Conservation;
  - Social (and cultural) issues;
  - Land-use and infrastructure development;
  - Water quantity and quality; and
  - The exploitation of living resources.

The Chairperson and Technical Working Group members are elected by the Forum/Trust as a whole which comprises all registered stakeholder. The Technical Working Groups should ideally include representatives from the authorities who have executive powers within the specific sector (e.g. conservation; water quality) as well as competent natural or social-science specialists acting in an advisory role.

In the case of the Gouritz EMP, Enviro-Fish Africa (Pty) Ltd. are fulfilling the role of formulating and initiating (Phase III) the EMP and will make recommendations that the Trust be empowered to ensure the implementation, monitoring and long-term running of the EMP.

12.2 THE ESTUARY MANAGEMENT PLAN

Key to the formulation of an EMP will be the organization of a stakeholder workshop in order to develop a Vision and Strategic Objectives for the Gouritz estuary based on the Situation Assessment (this report) and the future needs and desires of the stakeholders. These outcomes together with the assessment provided by Turpie and Clark (2007; Section 10 above) and the C.A.P.E. Generic Framework for EMPs (van Niekerk and Taljaard 2007) will be used to formulate the EMP.

Essentially the following tasks will be performed for Objective II:

- Assist in setting a Vision and Strategic Objectives for the Gouritz estuary.
- Develop a range of Management Strategies to achieve the Vision and Objectives.
- Prepare an Estuarine Zonation Plan and Operational Objectives based on the above.
- Identify Management Action Plans (MAPs) to achieve all strategies and operational objectives including implementation procedures.
- Propose an institutional structure for implementation of the EMP.
- Develop a monitoring and evaluation programme including a description of a process for reviewing the EMP.
- Identify research priorities.

For those who wish to review it in its entirety, a copy of the generic EMP framework has been included on the CD which can be obtained from the Municipality or the Trust.

12.3 THE STAKEHOLDER WORKSHOP

The workshop will be held at the Public Library hall in Gouritsmond on the 25th November 2008 and will concentrate on the development of a vision, strategic objectives and management strategies for the Gouritz estuary. A preliminary Estuary Zonation Plan (EZP) will also be presented and discussed in relation to the management strategies; the EZP will be adapted according to the outcomes of the workshop.

In order to provide stakeholders attending the workshop with some idea of what to expect, some useful background information is supplied in the sections below.

12.3.1 Vision

The Vision for the estuary should be inspirational, representing a higher level statement of strategic intent, while taking into account the Vision set for all estuaries within the greater Cape Floristic Region.

> ***Vision for Estuaries in the CFR:*** *Our estuaries are beautiful, rich in plants and animals, they attract visitors, sustain our livelihoods and uplift our spirits*

There are a variety of Visions quoted in this document, ranging from the Eden District Municipality IDP to the Hessequa IDP and SDF and the Hessequa Biodiversity Strategy. These will all be discussed during the workshop and it is proposed that some combination of these statements should provide the basis for the Vision of the Gouritz estuary.

12.3.2 Strategic objectives

The strategic objectives are generally qualitative statements of the values defined in the vision and should be statements of outcomes rather than means of achievement. For the Gourits, the strategic objectives proposed for the larger CFR (Table 12.1) need to be considered and can provide inspiration for the setting of estuary specific objectives.

The developed Vision and Strategic Objectives for the Gouritz may not conflict with that developed for the CFR. Strategic objectives for specific systems should be listed in priority order to guide subsequent management decisions. The Strategic Objectives must form the foundation for quantitative, operational objectives.

Table 12.1 Strategic objectives for estuaries of the CFR.

Strategic Objectives for the Estuaries of the CFR include:

Living resources: *Achieve targets for ecosystem biodiversity and health in terms of the long-term habitat persistence of habitats, species, community structure, biomass and functioning by 2015.*

Water quantity and quality: *Determine, implement, monitor and review Resource Quality Objectives (RQOs) (taking into account public health) in order to maintain or restore estuarine structure and function in the best attainable state for five priority estuaries within the CFR by 2010.*

Land-use and infrastructure planning: *Define estuarine areas, assess their current status and values and formulate appropriate integrated management plans to regulate development and other activities impacting upon them, with particular reference to cumulative impacts, by 2008 (focusing on mechanisms).*

Institutional and management structures: Cooperatively manage estuaries, through relevant institutions of management comprising appropriate spheres of government and civil society, according to appropriate management plans by 2010.

Climate change: *Minimise the detrimental impacts of predicted climate change by 2010 through:*

1) *Taking a long-term precautionary approach to infrastructure development and water-resource planning;*
2) *Influencing land management in upper and middle catchments to reduce impacts on estuaries; and*
3) *Promoting long-term sustainable livelihoods through estuarine management that minimises risks.*

Education and awareness: *Generate education and awareness regarding CFR estuaries by 2010, having:*

1) *Contributed to integrated, collaborative and informed action and decision making regarding estuaries;*
2) *Contributed to a sustainable quality of life;*
3) *Promoted good management practices that will sustain healthy estuarine functioning;*
4) *Raised awareness of the intrinsic value of estuaries and developed a sense of ownership of estuaries not only among local communities but throughout South Africa; and*
5) *Raised awareness of and insight into the legal context and obligations of all levels of government (national, provincial, local and community).*

12.3.3 Management Strategies

The Vision and Strategic Objectives may be achievable through various management strategies and these will be investigated and evaluated so as to optimally utilize financial and human resources. Existing institutional management strategies must be incorporated where appropriate. Before finalization of an EZP and the development of the Operational objectives, the different management strategies may have to be refined through collaboration with stakeholders; this will be addressed during the course of the workshop.

12.3.4 Estuarine Zonation Plan

Once management strategies have been agreed upon, these will need to be translated into an EZP and Operational Objectives.

An Estuarine Zonation Plan will be in the form of a map that clearly demarcates the following:

- Geographical boundaries of estuary;
- Conservation/Protected zones as well as degree or class of protection needed;
- Zones demarcated for the exploitation of living marine resources (e.g. fishing and bait collection);
- Important bio-physical features (open channel areas, Macrophyte beds, invertebrate beds, mud banks, sand banks, wetlands and salt marshes, etc);
- Areas earmarked for rehabilitation;
- Land-use and planning provisions of surrounding areas;
- Infrastructure (e.g. roads, bridges);
- Cultural and heritage sites;
- Existing and proposed recreational and tourist-based activities (swimming, boating, canoe trails, guided tours etc);
- Wastewater discharges (sewage, industrial)
- Stormwater drains
- Solid waste-dump sites.

The Operational Objectives and Management Action Plans required to achieve the Strateguc Objectives will be addressed subsequent to the workshop as will the implementation plan, monitoring and evaluation programme. A draft EMP report will be circulated to all IAPs for comment prior to finalization of the EMP report.

13. PUBLIC AND AUTHORITY PARTICIPATION AND LIAISON

Details of all those people that have been involved thus far in this project are provided in Appendix 1. Their input and assistance thus far is hereby acknowledged; their continued involvement is seen as vital to the successful formulation and ultimately implementation of the EMP. All Interested and Affected Parties (IAPs) will be involved in the forthcoming workshop and will have the opportunity to comment both on this document and the draft EMP prior to it being forwarded to Cape Nature as a finalized product.

14. REFERENCES

Allanson, B.R. 2001. The Gouritz Estuary: An Initial Assessment of its Status. Unpublished Independent Report. 6pp.

Anonymous. 1968. Verslag oor die Voorgestelde Weyersrivier Staatswaterwerk (Zandfontein Dam). Proposal submitted to Minister of Water Affairs.

BKS. 2003. Gouritz Water Management Area: Overview of Water Resources Availability and Utilization. National Water Resource Strategy. Report prepared by BKS for the Department of Water Affairs and Forestry, DWAF Report No P WMA 16/000/00/0203.

Cape Nature. 2007. Policy and standard procedures of Cape Nature for the regulation and administration of structures below the high water mark. 13pp.

Conservation Management Services (CMS). 2008. Gouritsmond Commonage: Veld and wildlife management guidelines. Report to Hessequa Municipality. 100pp.

Conservation Management Services (CMS). 2005. Vegetation Sensitivity Analysis: REM Gansfontein No. 450. Unpublished Report. 12pp + Appendix 1.

CSIR 2007. Preliminary zoning of human use of Cape estuaries based on sensitivity mapping and carrying capacity. C.A.P.E. Estuaries Programme. Version 1: September 2007.

Dennis Moss Partnership Inc. (DMP). 2004. Lower Gouritz River Spatial Development Plan: Towards the conservation and sustainable use of the Gouritz River ecosystem.

Department of Water Affairs and Forestry (DWAF). 2003. Preliminary determination of the Reserve and Resource Class – Quaternary Catchment J40D. RDM File No 661. (approved 13/03/2003).

DWAF. 2005. Proposal for the establishment of the Gouritz Catchment Management Agency. July 2005.

DWAF. 2007. Preliminary determination of the Reserve and Resource Class – Quaternary Catchment J40C. RDM File No 632. (approved 27/09/2007).

DWAF. 2007.State of Rivers Report: Rivers of the Gouritz Water Management Area. 47pp.

Harrison, T.D., Cooper, J.A.G. & Ramm, A.E.L. 2000. State of South African estuaries. Geomorphology, ichthyofauna, water quality and aesthetics. Department of Environmental Affairs and Tourism, State of the Environment Series Report No. 2. 126pp.

Heydorn, H.J. 1989. Estuaries of the Cape. Part II. Synopses of available information on individual systems. Report No. 38. Gouritz (CSW 25). CSIR Research Report No 437.

Ninham Shand. 2002. Gouritz Water Management Area: Water Resources Situation Assessment – Main Report – Volume 1 of 2. Prepared for the Department of Water Affairs and Forestry. DWAF Report No. P16/000/00/0101.

Ninham Shand. 2002. Workshop on ecological Flow Requirements Phase 2: Notes on proceedings. Appendix F6. Resources Situation Assessment – Main Report – Volume 1 of 2. Prepared for the Department of Water Affairs and Forestry. DWAF Report No. 2949b/7970.

Purves, A., Vlok, J. & Schutte-Vlok, A-L. 2006. The natural vegetation communities of the Gouritsmond Commonage. Cape Nature. 27pp.

Summers, R.W., Pringle, J.S. & Cooper, J. 1976. The status of coastal waders in the South-Western Cape, South Africa. Internal Report: Percy Fitzpatrick Institute of Ornithology. 162pp.

Taljaard, S. 2007. Interpretation of Legislation Pertaining to Management of Environmental Threats within Estuaries. Guideline 1: C.A.P.E. Estuaries Programme. 41pp.

Tinley, K.L. 1985. Coastal dunes of South Africa. *South Afr. Natl Sci. Programmes Rep*. No. 109. Pretoria.

Turpie, J.K., Adams, J.B., Joubert, A., Harrison, T.D., Colloty, B.M., Maree, R.C., Whitfield, A.K., Wooldridge, T.H., Lamberth, S.J., Taljaard, S. & van Niekerk, L. 2002. Assessment of the conservation priority status of South African estuaries for use in management and water allocation. *Water SA*. **28(2)**: pp191-206.

Turpie, J and Clark, B. 2007. Development of a conservation plan for temperate South African estuaries on the basis of biodiversity importance, ecosystem health and economic costs and benefits. C.A.P.E. Regional Estuarine Management Programme. Final Report; August 2007. 125pp.

Underhill, L.G. & Cooper, J. 1982. Counts of waterbirds at coastal wetlands in southern Africa; 1978-1981. Unpublished Report; Percy Fitzpatrick Institute of Ornithology.

Underhill, L.G. & Cooper, J. 1983. Counts of waterbirds at coastal wetlands in southern Africa: Estuaries; 1979-1981. Unpublished Report; Percy Fitzpatrick Institute of Ornithology.

Van Niekerk, L. and Taljaard, S. 2007. Proposed Generic Framework for Estuarine Management Plans. C.A.P.E. Estuaries Programme. 114pp.

Whitfield, A.K. 1992. A characterisation of southern African estuarine systems. *Southern African Journal of Aquatic Sciences* **12**: 89-103.

Whitfield, A.K. 2000. Available scientific information on individual estuarine systems. WRC Report no. 577/3/00. 217pp.

APPENDIX 1

Table A1.1 List of people and their affiliations that have shown an interest or been directly consulted in this study.

Name	Affiliation	Contact	
		Phone	E-mail
Pierre de Villiers	Cape Nature - C.A.P.E. Estuary Programme	021 8668023 0832362924	estuaries@capenature.co.za
Daan Swart	Chairman - Gouritz River Conservation Trust	0761912079	anitavdmerwe1@gmail.com
Willem Botha	Gouritz Initiative (Hessequa Municipality)	0827750596	
Charlie Rabbets	Gouritz River Conservation Trust	028 7453012 0829250030	
Vernon Gibbs-Halls	Municipal Conservation Officer	028 7132418 0726705108	gibbshalls@gmail.com
Pieter Franzsen	Vice-Chair: Gouritz River Conservation Trust	028 7453507	
Arne Purves	Past Municipal Conservation	0829408937	
Ivan Donian	Gouritz Initiative (George)	0823762162	
Org Niewoudt	Businessman and fisherman - Gouritsmond	0822538033	org@easycoms.co.za
Rhett Hiseman	Cape Nature (Riversdal)	028 7132366 0827719107	rhiseman@telkomsa.net
Jean du Plessis	Cape Nature (Stilbaai - Manager)	028 7542234 0824962522	jdp@telkomsa.net
Eric Van Zyl	Farmer		
Pieter Cronje	Farmer/resident - Gouritsmond		
Gordon Saville	Fisherman	028 7453330	
Frank Myburgh	Municipal River Control Officer	0824946172	
Hendrik Horn	Bitouville Representative	0826622562	
Anita Van Der Merwe	Assistant Manager: Municipality (Gouritsmond)		anitavdmerwe1@gmail.com
Elsa van Bruggen	Gouritz River Conservation Trust		
Malan Share	Fisherman - Gouritsmond	028 7453523	
Jolee	Gouritsmond Information Bureau		gouritsmond@telkomsa.net
Derrick Botha	Fisherman - Gouritsmond	0828646032	
Pieter Coetzee	Farmer	0287453020 0837633566	
Hyman Steyn	SA Sportfishing & Casting Association		hymie_sadsaa@absamail.co.za
Willie Enright	DWAF - Western Cape		enright@dwaf.gov.za
Jannie van Staden	DWAF - Cape Town		vstadej@dwaf.gov.za
Tovhowani Nyamande	DWAF - RDM, Sanlamhof		Ndiitwt@dwaf.gov.za
Jackie Jaye	DWAF - RDM, Pretoria		jayej@dwaf.gov.za
Antonia Belcher	Environmental Monitoring Consulting; Stellenbosch		toni.b@iburst.co.za
Lara van Niekerk	CSIR - Stellenbosch	0828203339	lvnieker@csir.co.za
Steve Lamberth	DEA&T:MCM	021 4023159 0828683834	

Appendix 2

Detailed Results - Ecological Water Requirements

Appendix 2A: Summary of IFR estimate for Quaternary Catchment J40E

```
Annual Flows (Mill. cu. m or index values):
MAR               =  564.024
S.Dev.            =  544.524
CV                =    0.965
Q75               =    0.000
Q75/MMF           =    0.000
BFI Index         =    0.154
CV(JJA+JFM) Index =    4.521

Ecological Category = C

Total IFR         =  101.864 (18.06 %MAR)
Maint. Lowflow    =   33.749 ( 5.98 %MAR)
Drought Lowflow   =    0.000 ( 0.00 %MAR)
Maint. Highflow   =   68.115 (12.08 %MAR)

Monthly Distributions (Mill. cu. m.)
Distribution Type : E.Karoo
```

Month	Natural Flows			Modified Flows (IFR)			
				Low flows		High Flows	Total Flows
	Mean	SD	CV	Maint.	Drought	Maint.	Maint.
Oct	31.564	47.831	1.515	2.137	0.000	3.760	5.897
Nov	49.282	90.748	1.841	2.816	0.000	6.000	8.816
Dec	49.896	122.890	2.463	2.725	0.000	6.127	8.852
Jan	41.814	115.331	2.758	2.368	0.000	5.125	7.493
Feb	57.551	141.998	2.467	3.024	0.000	6.018	9.042
Mar	77.548	160.665	2.072	3.943	0.000	19.714	23.658
Apr	66.818	134.766	2.017	3.676	0.000	6.018	9.694
May	46.376	82.733	1.784	2.926	0.000	5.539	8.464
Jun	32.487	71.339	2.196	2.409	0.000	0.000	2.409
Jul	27.862	53.612	1.924	2.236	0.000	0.000	2.236
Aug	47.172	101.269	2.147	3.014	0.000	5.615	8.629
Sep	35.653	63.823	1.790	2.475	0.000	4.200	6.675

Appendix 2B: Summary of IFR rule curves for J40E

Total Runoff : Quaternaries J40E
Regional Type : E.Karoo
Ecological Category = C

Data are given in m^3 * 10^6 monthly flow volume

Month	% Points									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	99%
Oct	9.205	6.332	3.031	1.256	0.650	0.480	0.000	0.000	0.000	0.000
Nov	13.750	9.995	5.189	2.239	1.117	0.783	0.000	0.000	0.000	0.000
Dec	13.957	10.654	5.976	2.693	1.288	0.000	0.000	0.000	0.000	0.000
Jan	11.956	9.532	5.762	1.328	0.000	0.000	0.000	0.000	0.000	0.000
Feb	25.217	16.150	4.946	2.287	0.000	0.000	0.000	0.000	0.000	0.000
Mar	72.749	43.613	10.246	4.926	2.903	2.301	0.000	0.000	0.000	0.000
Apr	27.254	16.174	4.133	1.772	0.967	0.740	0.000	0.000	0.000	0.000
May	13.147	9.049	4.340	1.809	0.945	0.702	0.000	0.000	0.000	0.000
Jun	4.414	2.796	1.136	0.353	0.111	0.046	0.000	0.000	0.000	0.000
Jul	4.032	2.385	0.884	0.261	0.084	0.038	0.000	0.000	0.000	0.000
Aug	13.236	8.590	3.824	1.576	0.880	0.693	0.650	0.000	0.000	0.000
Sep	10.446	7.183	3.435	1.419	0.732	0.538	0.000	0.000	0.000	0.000
Reserve Flows without High Flows										
Oct	3.972	2.679	1.194	0.396	0.123	0.047	0.000	0.000	0.000	0.000
Nov	5.301	3.787	1.850	0.661	0.208	0.074	0.000	0.000	0.000	0.000
Dec	5.211	3.921	2.094	0.812	0.264	0.000	0.000	0.000	0.000	0.000
Jan	4.573	3.604	2.098	0.890	0.000	0.000	0.000	0.000	0.000	0.000
Feb	5.782	4.351	2.324	0.901	0.000	0.000	0.000	0.000	0.000	0.000
Mar	7.422	5.302	2.590	0.925	0.292	0.103	0.000	0.000	0.000	0.000
Apr	6.832	4.609	2.054	0.681	0.212	0.081	0.000	0.000	0.000	0.000
May	5.438	3.668	1.635	0.542	0.169	0.064	0.000	0.000	0.000	0.000
Jun	4.414	2.796	1.136	0.353	0.111	0.046	0.000	0.000	0.000	0.000
Jul	4.032	2.385	0.884	0.261	0.084	0.038	0.000	0.000	0.000	0.000
Aug	5.524	3.499	1.422	0.442	0.139	0.057	0.039	0.000	0.000	0.000
Sep	4.600	3.103	1.383	0.459	0.143	0.054	0.000	0.000	0.000	0.000
Natural Duration curves										
Oct	114.938	68.708	33.078	15.378	3.518	1.338	0.000	0.000	0.000	0.000
Nov	165.378	71.878	47.798	23.728	6.008	1.918	0.000	0.000	0.000	0.000
Dec	133.288	63.098	27.688	10.558	1.918	0.000	0.000	0.000	0.000	0.000
Jan	172.898	32.068	15.898	1.328	0.000	0.000	0.000	0.000	0.000	0.000
Feb	220.878	98.168	22.708	4.198	0.000	0.000	0.000	0.000	0.000	0.000
Mar	196.078	74.508	63.178	43.258	23.698	11.088	0.000	0.000	0.000	0.000
Apr	212.288	87.558	53.228	29.768	17.268	7.098	0.000	0.000	0.000	0.000
May	212.338	60.898	38.638	19.428	13.448	3.258	0.000	0.000	0.000	0.000
Jun	101.058	51.998	23.148	15.358	7.008	1.928	0.000	0.000	0.000	0.000
Jul	102.998	38.418	25.188	13.498	6.848	2.428	0.000	0.000	0.000	0.000
Aug	132.298	49.048	21.338	16.378	8.948	6.078	2.618	0.000	0.000	0.000
Sep	121.128	55.968	25.198	14.698	7.888	3.978	0.000	0.000	0.000	0.000