City of Cape Town
Coastal Management Programme
2015

1. Introduction

The City of Cape Town has a coastline of 307km, of which it administers approximately 260km, the longest stretch of coastline of all local authorities in South Africa. The sustainable and integrated management of this coastline is central to Cape Town's economy, its future growth, social opportunities and environmental health and resilience.

On the 27th of November 2009, the President of South Africa signed the Integrated Coastal Management Act (Act 24 of 2008) into law. The Act came into operation on the 1st of December 2009. This Act for the first time provides a regulatory framework for the management of South Africa's coastline. Central amongst the regulatory frameworks within the Act is the requirement (section 48) that:

(1) a coastal municipality must -
- *(a)* within four years of the commencement of the Act, prepare and adopt *a municipal coastal management programme for managing the coastal zone or specific parts of the coastal zone in the municipality;*
- *(b) must review any programme adopted by it at least once every five years; and*
- *(c) may, when necessary, amend the programme.*

(2) Before adopting a programme contemplated in subsection (1)(a), a municipality must by notice in the Gazette invite members of the public to submit written representations on or objections to the programme in accordance with the procedure contemplated in Chapter 4 of the Municipal Systems Act.

(3) A municipality must, within 60 days of the adoption of the municipal coastal management programme or of any substantial amendment to it—
- *(a) give notice to the public—*
  - *(i) of the adoption of the programme; and*
  - *(ii) that copies of, or extracts from the programme are available for public inspection at specified places; and*
- *(b) publicise a summary of the programme.*

(4) A municipality may prepare and adopt a coastal management programme as part of an integrated development plan and spatial development framework adopted in accordance with the Municipal Systems Act and if it does so, compliance with the public participation requirements prescribed in terms of the Municipal Systems Act for the preparation and adoption of integrated development plans will be regarded as compliance with public participation requirements in terms of this Act.

Contents of municipal coastal management programmes (section 49)

(1) A municipal coastal management programme must—
- *(a) be a coherent municipal policy directive for the management of the coastal zone within the jurisdiction of the municipality; and*
- *(b) be consistent with—*
  - *(i) the national and provincial coastal management programmes; and*
  - *(ii) the national estuarine management protocol.*

(2) A municipal coastal management programme must include—

(a) a vision for the management of the coastal zone within the jurisdiction of the municipality, including the sustainable use of coastal resources;
(b) the coastal management objectives for the coastal zone within the jurisdiction of the municipality;
(c) priorities and strategies—
(i) to achieve the coastal management objectives of the municipality; and
(ii) to assist in the achievement of the national and provincial coastal management objectives as may be applicable in the municipality;
(iii) to address the high percentage of vacant plots and the low occupancy levels of residential dwellings;
(iv) to equitably designate zones as contemplated in section 56(1)(a)(i) for the purposes of mixed cost housing and taking into account the needs of previously disadvantaged individuals;
(v) to address coastal erosion and accretion; and
(vi) to deal with access issues.
(d) performance indicators to measure progress with the achievement of those objectives.

(3) A municipal coastal management programme may include—
(a) a programme of projected expenditure and investment by the municipality in coastal management infrastructure or in order to implement any coastal management programme;
(b) a description of specific areas within the coastal zone that require special coastal management, and management strategies for those areas;
(c) estuarine management plans; and
(d) any other matter that may be prescribed.

This document presents the City of Cape Town's Coastal Management Programme (CMP), as prescribed within the Act, but also as the overarching management framework for the City's coastline.

2. Overview and Structure of City of Cape Town's CMP

Management of the City's coastline is spread across a number of departments and line functions each providing specific management roles and services for various aspects of the coastline. As a result it is essential that the City's CMP provide an integrating framework to ensure that these management roles and responsibilities collaborate and coordinate to achieve a collective vision and standard for the coastline.

The City of Cape Town's approach to its CMP is to compile an extensive document that is a combination of four key elements:

- Sets policy where appropriate
- Clearly defines departmental roles and responsibilities for all aspects of coastal management
- Local coastal regulation and enforcement through the by-law
- Outlines and details a number of management protocols

In structuring and ordering the chapters, the City's CMP follows a logical flow of policy and principles, institutional accountability and responsibility, legislative components, and then specific management and operational protocols. The document therefore not only provides a clear management framework for the City in its approach to managing the coastline, but serves equally as a substantial document to the City's public that clarifies the various roles and responsibilities across the City and the various approaches.

3. Structure of the CMP

The CMP should be considered at all times as an evolving document that will be updated, added to and amended as need be. As such, the City's CMP has been structured as a single document comprising a number of individual chapters dedicated to specific aspects of the overall approach to and management of the coast line. This approach allows the amendment, review or addition of individual chapters as needed without having to review and revise the entire document.

Notwithstanding this approach of ongoing improvement, the entire CMP will undergo a review as required by the Act, five years after adoption by the City.

3.1. List of chapters:

1. Coastal Institutional Roles and Responsibilities
2. Integrated Coastal Management Policy
3. Coastal Land Policy: Purchasing and Leasing
4. Coastal Edge and Setback Line
5. Coastal By-law
6. Economic and Spatial Plan
7. Coastal Overlay Zone
8. Coastal Access Land
9. Coastal Development Nodes
10. Coastal and Sea Defence Decision Framework
11. Marine and Coastal Law Enforcement Strategy
12. Coastal Emergencies (ship stranding and oil spill)
13. Large Marine Animal Stranding Protocol
14. Coastal Risk Register
15. Marine Access Points
16. Coastal Recreational Use Zones
17. Shark Safety
18. Blue Flag Strategy
19. Trek-net Fishing Protocol
20. Dune Management
21. Helderberg MPA Management Plan
22. Coastal Conservancies
23. Estuary Management Plans
24. Water Quality Monitoring and Public Health Protocol
25. Coastal Signage and Information
26. Coastal Cleaning Protocol
27. Coastal Monitoring Programme
28. Education, Awareness and Training
29. City of Cape Town Events Policy
30. Coastal Committee(s)
31. Monitoring and Reporting

4. Cape Town's Coastal Context: Social

Cape Town's coastline is at the core of its sense of place, identity, heritage and cultural history. Two large bays – Table Bay and False Bay – define the coastline and two sets of mountain ranges run alongside the coast, creating a unique landscape found in few other places in the world. The historic development of Cape Town is directly linked to the establishment of a refreshment station in Table Bay in 1652. For millennia prior to that event, indigenous people have been utilising the coastal resources for food.

The coastline remains socially central to Cape Town's communities within a broad context as well as within local community based contexts with direct associations between communities and their adjacent coastal environments. The Kalk Bay and Hangberg fishing communities are examples of inseparable links between Cape Town's people and their coastline.

4.1. Sense of Place and Identity

Cape Town as both a city and community has a unique and strong sense of place and identity. This sense of place and identity is linked to the varied and diverse coastline that surrounds Cape Town, the coastal landscapes and vistas, and the cultural heritage of a city that developed from sea trade, and is one that remains closely embedded in the coastal environment.

Globally recognised as one of the world's most beautiful cities, Cape Town's coastal environment is internationally recognised as central to that beauty and desirability.

This sense of place and identity has a localised diversity that contributes significantly to the overall social value of the coastline. Influenced by cultural, historical, community and physical factors, Cape Town's coastal sense of place is diverse and varied. Kalk Bay presents a unique coastal village feel strongly entrenched in a fishing heritage, Camps Bay presents a more global fast paced and dynamic coastal space, Muizenberg Corner provides a sense of cultural diversity and coastal recreation while Misty Cliffs provides a rural coastal feel of untouched coastal spaces. It is this localised diversity of varied and unique coastal spaces that collectively create the strong sense of place and identity.

4.2. Social wellbeing

Quality of life is highly dependent on social wellbeing which in turn is dependent on a variety of factors. Cape Town has emerged from a difficult and unequal history with many inequalities remaining. Beyond the central social wellbeing factors of access to quality services, employment, health, housing and safety, access to quality natural environments and spiritual spaces are imperative. Cape Town's coastline is central to the overall social wellbeing of its citizens and visitors through:

- Extraordinary landscapes and vistas
- Open and free access to a diverse coastline
- Multiple recreation opportunities
- Marine access
- Presence of marine fauna and flora
- Freely accessible amenities and facilities

Loss or degradation of the coastline would severely diminish social wellbeing across all population groups.

4.3. Recreation

Coastal recreation is at the heart of the social value of the City's coastline. Freely accessible coastal and marine environments provide a host of recreational opportunities across the City. From simple leisure activities such as family time, sunbathing, swimming and beach walks through to open water sailing, surfing and recreational fishing, the coast offers diverse recreational opportunity for everyone.

Maintaining and retaining quality coastal environments and the associated amenities is central to optimising the recreational potential of the coastline, while planned and directed future investment and infrastructure development along the coastline will further enhance the recreational value and potential. In addition, securing and guaranteeing free access to the coastline as a shared, common space, for all is essential to retain the social recreational value

4.4. Integration and Community

Cape Town is a city that has emerged from a history of legislated racial segregation. Although the birth of democracy ended legislated segregation, historical Apartheid urban planning has left the city with a legacy of inequality and social segregation. The coastline is one of key the spaces in Cape Town where communities from across the cultural, social and economic spectrums converge and interact. Muizenberg Corner is an example of this where on any given day individuals from across Cape Town's diverse social and economic groups interact and share a common space through simple recreation. This integration at coastal spaces is not uniform, but given the City's investment in public transport and urban transformation, coastal areas will increasingly reflect Cape Town's diversity.

5. Cape Town's Coastal Context: Economic

Global recognition that Cape Town is one of the world's most beautiful cities, as well as the recent New York Times, Guardian and National Geographic articles that rank Cape Town as one of the world's top tourist destinations, re-affirms that tourism and our city's natural and cultural beauty and social diversity is at the core of its economy.

In a study commissioned by the City of Cape Town in 2009, it was estimated then that, conservatively, Cape Town's natural assets contribute between R2 billion and R6 billion per annum to the economy. In this study the economic value alone of recreation on Cape Town's beaches was estimated at over R70 million per year while the coastline as a whole contributed over R375 million per year. These estimated values do not include the economic contribution of port activities, shipping, fishing or their associated economies, or other tourist spending that occurs when tourists visit the coast. The economic value and importance of the City's coastline cannot be over-estimated.

5.1. Wider Economy

As a coastal city, substantial components of our economy are directly linked to the marine and coastal environment. These economic activities not only drive the financial economy but contribute significantly to employment opportunities. These economic drivers include but are not limited to:

- Cape Town Port and shipping traffic
- Marine vessel, servicing, building and repairs
- Commercial fishing industry
- Small scale commercial fishing industry
- South African Navy
- Koeberg Power Station

5.2. Tourism

Between 2009 and 2012 the city received approximately 1.3 million international tourists per year, and approximately 1.2 million local tourists per year. In a 2007 survey, 35% of tourists highlighted the coast as the central reason for their choice of Cape Town as a destination. A recent study in 2013 estimated the total contribution of tourism to Cape Town's economy as approximately R14.6 billion in 2012.

Since 2002, the Victoria and Alfred Waterfront has contributed almost R200 billion to the economy and a similar amount is expected over the next decade.

5.3. Property Values

Property values in Cape Town are directly linked to proximity of desirable environments and landscapes. Along the City's Atlantic Seaboard are some of the highest property values on the African continent, primarily determined by the proximity of these properties to the coastline as well as the coastal view sheds. This pattern of value associated with the coastline extends beyond the Atlantic Seaboard across the City's coastline.

High property values not only contribute to the economy but are a key component of the City's rates base as well as highlighting Cape Town as an international investment location of choice.

5.4. Future Economic Growth

The coastline has substantial potential to unlock further economic growth within Cape Town. Planned, directed and risk–averse investment and appropriate development along the City's coastline will enhance economic activity in multiple ways. However, future development and investment must be planned and directed in such a way as to not erode the existing economic value of the coastline, but rather to enhance it further by retaining the natural capital and integrating a natural systems approach towards development and infrastructure.

5.5. Risk Reduction

Finally, it is important to recognise that the City's coastline is a buffer between hard infrastructure and a marine environment notorious for large waves, strong seas and high winds. The role and function of our coastline as a buffer to storm surge and predicted mean sea level rise in economic terms is extensive. A 2010 study by the City estimated that private and public property at risk from storm surge events was in excess of R55 billion.

A protected, well-functioning and healthy coastal system provides the most effective protection for property at risk. If the natural functioning of the coastline is lost, replacement of the natural buffer of the coastline with engineered coastal defences is likely to be unaffordable. The loss of coastal space to storm surges and sea level rise will have substantial economic impacts across the City's economy. As such, the economic importance of the coastal system as a natural defence to storm surge must not be under-estimated.

6. Cape Town's Coastal Context: Physical

Approximately 43% of Cape Town's coastline consists of sandy beaches, with the remaining extent comprising rocky shores. A number of important physical processes affect the coastal zone. These include wave processes, nearshore currents and circulation, sediment transport and sea level rise.

The intersection of two ocean currents – the warm Agulhas and the cold Benguela current - contributes to the unique local ecology of Cape Town's coastline. Strong south-easterly winds, predominant in summer, additionally contribute to the marked difference in temperature between False Bay and the west coast. The southeaster, which reaches gale-force at times, pushes and pulls the surface layer of seawater along with it. In False Bay, this has the effect of piling warm water up along the coast, so summer water temperatures generally stay within the 16-22°C range. West of Cape Point, the southeaster pushes surface water in a northerly direction, but it is deflected offshore due to the earth's rotation to the east. Cold water from the deeper ocean rises up to replace it in a process known as upwelling, and sea temperatures typically hover in the10-15°C range.

6.1. Upwelling

Upwelling ensures that the West Coast is South Africa's most productive marine environment. Upwelled water is rich in nutrients, especially nitrates formed as a by-product of the decomposition of organic matter, which constantly sinks down to the seafloor. The nitrates act as a fertiliser for phytoplankton, which forms dense 'blooms' that are grazed by zooplankton. Plankton are consumed by pelagic fish which are in turn food for larger fish as well as seabirds, seals and dolphins. The abundance of fish supports South Africa's purse seine and trawl fisheries, while the region's dense kelp beds provide habitat for West Coast rock lobster and abalone.

6.2. Rocky shores

Rocky shores range from headlands with vertical rock faces and steep cliffs, to wide wave-cut rock platforms, landscapes of varied-sized boulders, or pebble beaches of smooth stones. In some areas rocky shores extend for many kilometres along the coast, while in others they occur as outcrops separated by river mouths or sandy beaches.

Animals and plants that live within the intertidal zone of rocky shores are adapted to survive the harsh and variable conditions associated with high and low tides, and the distribution of species on rocky shores is largely determined by their ability to withstand these physical stresses. Those found low on the shore, where they are only exposed for a short time at low tide, are not adapted to survive conditions higher up, where only the hardiest species occur. Shell middens associated with the harvesting of mussels by indigenous people are often found close to rocky shores.

6.3. Sandy beaches

Sandy beaches are extremely dynamic systems, constantly reshaped by wind, waves and currents.
In the sea, waves and currents continually move sediment along the shore, as well as onshore and offshore, whereas on land, wind blows sand up and along the beach. Sand trapped by plants growing near the drift line forms mounds called hummocks, which initiate the development of foredunes. Sandy beach systems therefore consist of a marine wave-driven ecosystem and a terrestrial wind-driven ecosystem that together make up the littoral active zone – the area in which sand exchange occurs.

Although sand exchange is an ongoing process, it varies throughout the year. During stormy weather, rough seas erode sand from the beach and foredunes and the sand is deposited as an offshore sandbar. When calm conditions return, gentle waves carry the sand back to replenish the beach. In this way, the beach undergoes seasonal cycles of erosion and accretion, although major storm events can cause long-term changes. Structures in the littoral active zone, such as breakwaters and buildings impede this natural process of sand exchange, and may result in erosion or sand inundation problems. Similarly, destroying the foredunes through development or mining removes the reservoir that supplies sand to the beach during periods of erosion. The same applies to artificial sand stabilisation with vegetation.

6.4. Estuaries

Estuaries – where rivers meet the sea – represent a transition zone between the freshwater and marine environments. Their salinities fluctuate on a daily and seasonal basis according to the tide and the strength of river flow. While many estuaries are permanently open to the sea, others are closed by sandbars during periods of low rainfall, when river flow is too weak to scour away sand accumulating at the mouth. Animals and plants living in estuaries are adapted to survive these variable conditions. However, evaporation from closed estuaries may result in exceptionally saline conditions, while high freshwater input during floods causes a dramatic reduction in salinity. Extremes of salinity that are beyond the tolerance range of estuarine plants and animals have been known to cause mass mortalities.

Most of Cape Town's estuaries are surrounded by intense development, which has had a variety of impacts on these fragile systems. Activities and development in the broader catchment areas also affect estuaries.

6.5. Dunes[1]

Dunes are a key coastal feature along many parts of the City of Cape Town's coastline. They are accumulations of sediment bounded at their seaward edge by the upper line of the beach, at approximately the annual highest tide mark, and extending landward until they are no longer subject to gain or loss of sediment due to coastal and aeolian processes. Dune formation (in the case of vegetated coastal dunes) is initiated when aeolian sediment (entrained beach sediment) is trapped by vegetation growing above the high water mark resulting in an accumulation in the form of a foredune.

Cycles of sediment deposition and accumulation, combined with the growth of vegetation adapted to the influx of aeolian sediment, eventually lead to the formation of complex dune systems. Dunes serve as a protective buffer for the coast against storm seas and high spring tides. Under eroding conditions, sand trapped in a dune system can be returned to the nearshore environment, thus preventing long term beach erosion. Vegetated dunes protect houses, roads and recreational facilities against corrosive sea spray, sand blasting and inundation by sand blown inland from the beach and therefore deserve special management attention (protection).

The structure and dynamics of dune systems depend on where and how the sand is supplied to them either from the beach or from landward sediment reservoirs (in the case of transgressive, mobile dune systems). Dune blow-outs and mass aeolian sediment movement, such as at Witsands (between Kommetjie and Scarborough) or Hout Bay (a now deactivated headland bypass dune system) also constitute natural processes, most of which have now been interrupted by development, alien invasive plants and both necessary and unnecessary dune management (stabilization). A dune cordon situated closest to the beach is generally described as a primary or frontal dune while those situated further landward are called secondary or backdunes. The frontal dune comprises a very fragile environment. Any disturbance of the vegetation due to human activities can destabilise dunes resulting in both the elimination of rare coastal ecosystem features and windblown sand problems in adjacent developed areas. Historically, developments have often been sited too close to the beachfront, often in or immediately behind the foredunes.

6.6. Sediment transport[2]

The littoral active zone comprises dunes, beaches, sand bars in the surf zone and river and estuary mouths. It is essentially unstable and dynamic. The presence of structures requiring stable, fixed foundations is therefore incompatible with the dynamic nature of the littoral active zone. The structures also interfere with the natural patterns of sediment movement both within and between dune and beach systems. This can cause or aggravate problems such as beach erosion. The littoral active zone is a high-risk area for development as fixed structures are also subject to the encroachment of windblown sand. Sand found close inshore and particularly that associated with the formation of beaches along the coast, originates from fluvial sources and the disintegration of rocks and shells in the nearshore environment. The major input sources of sediment to the study area are beach and dunes, possible offshore sources and the larger rivers in the area (e.g. the Eerste, Diep and Lourens Rivers). Periodic flood-derived pulses of sediment are transported into the study area from these rivers, but the amounts are relatively small and somewhat intermittent.

Beaches consist of sediments (mostly sand and shell fragments) and therefore beach changes (in terms of the profile and shoreline recession/progradation) can only occur if there is movement (or transport) of the sediment. Sediment transport in the nearshore region is usually categorized as *longshore* (parallel to the

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[1] CSIR, 2001. State of the Coast: First Edition. City of Cape Town Coastal Zone Strategy Development – Phase 1.CSIR Report No. ENV-S-C 2001-071, Stellenbosch

[2] Ibid

shoreline) or *cross-shore (*perpendicular to the shoreline) sediment transport. On an exposed beach, *aeolian* (windblown) sediment transport also plays a role. In general, sediment is very rarely moved by only one mode of transport; longshore, cross-shore and aeolian sediment transport occur simultaneously. Even on a long straight beach, the current circulation pattern (including rip currents) and the associated sediment transport patterns are very complex and variously influence different sections of a beach. Furthermore, marine sediment transport is dependent on wave and tide conditions with the result that it changes continually, not only in direction and rate, but also in the location where it takes place in the nearshore zone. The three main modes of sediment transport in the nearshore region are described below:

Longshore sediment transport

When waves that advance towards the coast reach the nearshore zone, sediment (predominantly sand) is stirred up. Although nonbreaking waves also move sediment, most of the sand is transported inside the surf zone where wave breaking is the primary agent for suspending sand and moving sand along the bottom. Longshore currents can usually not entrain sediment on their own; however, sand stirred up by the breaking waves is transported alongshore by these currents. The combined effect of breaking waves and a longshore current creates the potential for significant transport of sediment alongshore within the littoral zone. Along an exposed beach, most of the longshore sediment transport occurs from about +2 m to Mean Sea Level (MSL) and to depths of less than about 8 m to 10 m to MSL. It is has been established that more sediment is transported in the surf zone than outside it. Depending on the environmental conditions, sediment is transported alongshore both upcoast and downcoast. The net longshore transport is the difference between the upcoast and downcoast transport rate. The gross transport is the sum of the upcoast and downcoast transport rates. Actual sediment transport also depends upon the availability of movable material. Thus, extensive rocky areas within the surf zone may significantly reduce the transport rate. It should also be taken into account that the longshore transport rates fluctuate considerably from year to year (Schoonees, 2000). A gradient in the longshore transport rate along a coastline can, in the long term, cause either erosion or accretion problems. These gradients can sometimes be identified by analysing long-term coastline changes. If the longshore sediment transport is interrupted by an obstruction such as a groyne or a breakwater, accretion will occur on the updrift side and erosion on the downdrift side. The latter is due to the fact that the sand that previously fed the downdrift beach is trapped and thereby prevented from reaching the downdrift beach.

Cross-shore transport

Cross-shore transport may result from any water movement that has a component in the cross-shore direction and which has sufficient velocity to transport sediment. A typical example of cross-shore transport is the on/offshore sediment transport resulting from (shorter-term) changes in the incident wave conditions. Cross-shore sediment transport is usually a swift process whereby a beach is eroded near the waterline during a storm. The sand is transported seawards and deposited in deeper water where it forms an underwater bar on which the storm waves break. When the sea calms down again, sand is slowly transported back to the beach, thus re-establishing approximately the original beach profile if no net loss of sand has occurred. Most of the transport occurs in depths less than 10 m to MSL and typically, insignificant volumes of sand are transported cross-shore in depths greater than 10 m to 15 m to MSL along exposed beaches. Beach profile slopes can be directly related to sediment grain sizes (Wiegel, 1964) and are usually also indicative of the wave energy distribution along the coast. To determine the degree of exposure of a beach, it is therefore important to know both the beach slope and the median grain size, because these parameters are interlinked.

Aeolian or windblown sediment transport

Aeolian, or windblown sediment transport, occurs when sufficiently strong winds blow over sandy areas (e.g. beaches and mobile dunes), putting the sediment into motion. Most of this windblown sand is usually transported in a layer of up to a metre high above the beach or dune surface. Optimum conditions for windblown sand transport are the availability of dry, loose sand, strong winds, no vegetation, and a long wind fetch (i.e. a long expanse of sand over which the wind can blow). Usually, the rate of aeolian sediment transport is orders of magnitude lower than the wave-driven transport rate along an exposed coast. However, the windblown component can be critical to the maintenance of both shoreline stability and the natural equilibria within dune systems. A wrongly located development, such as a parking area or other structure placed within or adjacent to an area subject to aeolian sediment transport, can also result in high ongoing maintenance costs.

6.7. Biological features[3]

The coastal zone of the City of Cape Town occurs at the intersection of the cool-temperate west coast and the warm-temperate south coast of the subcontinent. The region experiences a Mediterranean climate with warm, dry summers and cool, wet winters (DEAT, 1998), creating a specific environment within which the terrestrial ecosystems that are represented locally have evolved. The area has a particularly high biodiversity. For example, the beach surf zone of False Bay is an important nursery for juvenile fish such as the Cape Silverside and the Sand Steenbras (Taljaard *et al.,* 2000). Furthermore, the seaweed flora of False Bay is remarkably diverse, most likely because of the varied water temperature regime of the bay (Taljaard *et al.,* 2000). One of the few mainland breeding sites of the African (Jackass) Penguin, which is rated as "vulnerable" in the South African Red Data Book, is located at Boulders Beach south of Simon's Town. Kelp beds, seals and species such as pilchards, anchovies, rock lobsters and abalone are found in the cold coastal waters (DEAT, 1998).

There are two main types of vegetation represented within the City of Cape Town's coastal zone: Cape Flats Dune Strandveld and various types of Fynbos (McDowell and Low, 1990, CMC, 1999, Heijnis *et al.,* 1999). Cape Flats Dune Strandveld is found primarily on alkaline (calcareous i.e. lime-rich) sandy soils, and Fynbos on the acidic sandy soils derived from sandstones and granites and acidic dune sands. Both rocky and sandy shorelines also support a narrow strip of strand or littoral vegetation.

Strand vegetation consists of a sparse and patchy cover of a few characteristic, highly salt- and wind-resistant plant species. On rocky shores they form a narrow fringe between the exposed rocky shore and the terrestrial vegetation. On sandy shores, their ability to colonise open, windblown sand plays a key role in stabilising windblown sand where the prevailing movement is from the sea to the land. Once they have stabilised the sand (foredune formation has been initiated) then other dune species (Strandveld or Fynbos) can also become established and a natural succession to complex dune plant communities follows. Dune vegetation is sensitive to disturbance, for example trampling by people, so it is critical to control access and zone usage.

Cape Flats Dune Strandveld vegetation is dominated by evergreen shrubs and has an understorey dominated by herbaceous species (grasses, geophytes, annuals) which are dormant in the summer. The shrubs and herbaceous species are able to re-establish from seeds or by sprouting after a fire but the vegetation does not require fire to maintain it in a healthy condition. Shrubs are generally dominant where the soils are well-drained and herbs and grasses where the water-table is shallow, either seasonally or permanently. Reeds dominate areas where the water table is permanently shallow or where there is surface water for most of the time. When the vegetation is cleared or removed by burning, the sand is easily destabilised (CMC, 1999). This can lead to blow-outs and problems with windblown sand.

Both Cape Flats Dune Strandveld and Fynbos ecosystems are threatened by invading alien plant species (Van Wilgen *et al.,* 1992, Richardson *et al.,* 1996, Heijnis *et al.,* 1999). The most important invaders in the coastal areas are the Australian wattles: Rooikrans (*Acacia cyclops*) and Port Jackson (*A. cyanophylla*). In some areas Kikuyu (*Pennisetum clandestinum*) is an important invader. If the invading species are not controlled then they will displace the natural plant and animal communities. Sand mining is an important threat to the remaining Strandveld and dune or sand-plain Fynbos ecosystems. Agriculture is not viewed as a threat

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[3] Ibid

in the coastal zone (as defined here) because either the exposure to wind and sea influences makes the area unsuitable or the agricultural potential is inherently low.

The Fynbos and Strandveld communities provide a habitat for a wide variety of fauna including many rare and threatened species (Picker and Samways 1996, CMC, 2000). Many of these species (e.g. frogs, mongooses) are also found inland, with the coast being the natural limit of their distributions. There are some species whose habitat is confined to the coastal zone as defined in this report, including Black Oystercatchers and a number of species of waders (Ryan *et al.,* 1991, Hockey, 1998). Some birds roost or nest, or both, in the coastal zone; these will be described in the relevant coastal units. Cape clawless otters (*Aonyx capensis*) make extensive use of the inshore coastal environment and river mouth areas and the adjacent terrestrial ecosystems of the coastal zone may be important for their survival.